

Report on Opisthobranchiata from the Abrolhos Islands, Western Australia, with Description of a new parasitic Copepod. By CHAS. H. O'DONOGHUE, D.Sc., F.R.S.C., Professor of Zoology, University of Manitoba, Canada. (Communicated by Prof. W. J. DAKIN, D.Sc., F.L.S.)

[Percy Sladen Trust Expedition to the Abrolhos Islands  
under the leadership of Prof. W. J. DAKIN.]

(PLATES 27-30.)

[Read 21st June, 1923.]

FROM a very cursory examination of the distribution of the Opisthobranchs, it is evident that the Indian Ocean is very rich in members of this group and is characterized particularly by certain genera. For this reason we may look forward to the coasts of Australia furnishing a large number of interesting forms. Up to the present, however, they have not been studied in this area with any degree of thoroughness, save in the neighbourhood of Sydney by Angas (7) and less extensively in South Australia by Basedow and Hedley (8). In Western Australia it may be said that no systematic collecting has been done, so that our knowledge of the Opisthobranch fauna of this coast is very limited.

The present collection, while small in numbers, is, nevertheless, interesting and, it is to be hoped, useful. Certain of the species themselves appear to be new, and some of the others, although previously recorded, have only been incompletely described, so that it has been possible in all cases to give here further essential information regarding their structure or distribution and to clear up certain doubtful points. In these ways therefore it will extend our hitherto meagre knowledge of Western Australian forms and so help to fill a noticeable gap.

The student of the Opisthobranchiata, and especially the Nudibranchiata, is generally faced with one of two very serious difficulties. On the one hand, if he collects living material, he does not as a rule have the opportunity to dissect it and, more particularly, to examine the radulæ. On the other hand, if he is working out a collection in a museum or laboratory, while he is able to make such dissections and preparations of the radulæ as the material allows, he is usually not in a position to recognize the original colour, or perhaps even shape, of the living creature. I doubt if any other group of animals is so disappointing when preserved; anyone used to seeing them alive, with their beautiful coloration and often graceful shape, would hardly recognize them in the shrivelled discoloured lumps that they become after preservation. Hence it follows that unless the two aspects are dealt

with simultaneously, there is always the possibility of one species receiving two different names, one from the collector who knows the living animal and the other from the laboratory worker who has handled only preserved material—indeed, it would not be difficult to cite instances of this. That this may occur in Australian material is made possible in the case of the paper by G. F. Angas on the Nudibranchs of New South Wales (7). This work is illustrated by a number of excellent coloured figures, from which I should judge a collector would have practically no difficulty in recognizing the living forms at once. As no details or figures of the radulæ or other internal organs are given, however, it would be impossible to recognize a number of the species from a collection of preserved material without colour-notes.

This difficulty may be overcome if the same person works at the forms from the two aspects, or by the co-operation of two individuals. In the present case I have been fortunate enough to look through the collection with Professor Dakin, who gave me colour-notes, which, while brief, should be sufficient to allow of the easy recognition of the living animal. In two instances he supplied me with coloured drawings.

It has already been noted that the Opisthobranchs of Australia are but little known, and they would well repay further study, but it is of the utmost importance that when collections are being made adequate colour-notes of the living animal should be taken.

The list of workers who have treated of West Australian forms is very limited. The earliest records are those of Cuvier, 1804 (31), who described two species of Nudibranchs brought back by Péron from that coast. Quoy and Gaimard in 1833 (68) described one further species. Sowerby in 1869 (71) described the shell of a Tectibranch from the Cuming collection in the British Museum. In 1876 Abraham (1) described another Nudibranch from the British Museum material, and Bergh (12) one from the Cuming collection in the British Museum. A species brought back by Dr. Studer in the 'Gazelle' was described by Bergh in 1880 (22). Kent (54) in 1897 recorded a single species that actually came from the Abrolhos Islands. Lastly, in 1917 Odhner (59) described three further Nudibranchs which were brought back by Dr. Mjöberg's Swedish scientific expeditions to Australia in 1910-13.

The species recorded therefore are :—

#### TECTIBRANCHIATA.

*Tethys* [*Aplysia gigantea*] (Sowerby), recorded from Swan River.

#### NUDIBRANCHIATA.

##### CLADOHEPATICA.

*Scyllæa pelagica* Linn., recorded by Cuvier from Terre d'Edels.

*Phyllirhoë lichtensteinii* Eschscholtz, recorded by Quoy and Gaimard from Terre d'Edels.

*Armina* (*Pleurophyllidia*) *cygnea* (Bergh), recorded from Swan River.  
*Madrella ferruginosa* Ald. & Hancock, recorded by Odhner from Cape Jaubert.

## HOLOHEPATICA.

*Hexabranclus imperialis* Kent, recorded from the Abrolhos.  
*Kentrodonis maculosa* (Cuvier), recorded from Baye des Chiens marins.  
*Ceratosoma brevicaulatum* Abraham, recorded from West Australia.  
*Ceratosoma corallinum* Odhner, recorded from Cape Jaubert.  
*Phyllidia varicosa* Bergh, recorded from Dampier's Archipelago.  
*Trevelyana marginata* Odhner, recorded from Cape Jaubert.

This is a small list of only 11 species and the present collection contains 16 species, only three of which have been recorded previously from West Australia, and so the total now known from the coast is 24—a very small number when one considers the length of the coast-line and the fact that there is every indication of its possessing a rich fauna.

The following species are here represented:—

## TECTIBRANCHIATA.

*Tethys* [*Aplysia*] *gigantea* (Sowerby).  
*Tethys* [*Aplysia*] *denisoni* (Smith).  
*Dolabrifera pelsartensis*, sp. nov.  
*Berthella plumula* (Montagu).

## ASCOGLOSSA.

*Placobranclus expansa*, sp. nov.

## NUDIBRANCHIATA.

## HOLOHEPATICA.

*Spherostoma* [*Tritonia*] *dakini*, sp. nov.  
*Hexabranclus imperialis* Kent.  
*Alloiodoris hedleyi*, sp. nov.  
*Asteronotus fuscus*, sp. nov.  
*Glossodoris* [*Chromodoris*] *westraliensis*, sp. nov.  
*Aphelodoris affinis* Eliot.  
*Ceratosoma brevicaudatum* Abraham.  
*Dendrodoris* [*Doriopsis*] *nigra* (Stimpson).  
*Dendrodoris* [*Doriopsis*] *mammosa* (Abraham).  
*Nembrotha purpureolineata*, sp. nov.  
*Notodoris gardineri* Eliot.

With such a small list it is hardly profitable to spend much time in the discussion of the distribution and relationships of its members, for as soon as any systematic collecting is done the list will be enormously increased.

Professor Dakin has called attention to one or two points in his general description of the expedition (32) that need brief consideration here. In

the first place, the Abrolhos Islands are probably the most southern coral-islands in the world. A tropical current from the north and north-east passes down and bathes their shores, and the available evidence goes to show that the temperature of the sea round the islands is usually some degrees higher than that near the adjacent coast—indeed, even in the winter, it rarely falls below 20° C. He further suggests that if a preponderance of tropical species is found it will probably be due to this warm current, although the fishes apparently are southern forms.

Of the Tectibranchs, one (i. e., *T. gigantea*) has been recorded previously from Queensland. The two genera *Dolabrifera* and *Placobranchus* are, on the whole, distinctive of tropical or sub-tropical seas, while *Berthella* is perhaps more widely distributed.

It may be stated of the Nudibranchs that, as a general rule, the Cladohepatica are characteristic of cool or cold waters, while the Holohepatica characterise warmer regions. It is therefore probably not without significance that all the forms in the present Abrolhos material belong to the Holohepatica. In passing, too, it may be worth while to notice that, of the Cladohepatic genera recorded from the coast of the mainland of Western Australia, i. e., *Armina* (*Pleurophyllidia*), *Scyllaea*, and *Madrella*, the two former are of world-wide distribution and the last is a more or less tropical group. All other West Australian forms so recorded are Holohepatic. Turning again to the present material, the Sphærostomids are universally distributed, but practically all the other genera are distinctly those of tropical and sub-tropical seas.

Comparing this list with that of the British coast or of the northern part of the Pacific Coast of North America, the difference is most striking, and it is impossible not to recognize that it is far more sub-tropical in character. Cold-water groups appear to be entirely unrepresented up to the present, and it is hardly possible that, even if found, they will ever outnumber the tropical and sub-tropical genera.

We may conclude, therefore, that, as far as the Opisthobranchs at present known are concerned, the fauna of the Abrolhos Islands is distinctly sub-tropical or tropical in its constitution.

The remarkable way in which the ordinary usages of systematic taxonomy have not merely been ignored but flagrantly violated by many workers on Nudibranchs has created such a series of pitfalls that even with the utmost care it is almost impossible to avoid them all. Among the most obvious of these are examples where species have been given new names, apparently because the author did not like the previous one, and this although the older name has many years' priority, and the identity of the two forms is emphasized. Again, several genera have been combined and a new generic name invented, or the reverse of this may have happened and an old genus split up to make way for two or more new ones, while the original name has been



discarded. It is obvious that, if this sort of procedure goes on unchecked, the ultimate result will be a chaotic muddle, out of which it will be very difficult to find a way. The present author, in conjunction with Iredale (51 a), has spent a great deal of time in an attempt to straighten out the tangle of the synonymy of the British Nudibranchiata, and, as a result, certain fairly widely used generic names have been replaced by less known ones. The very obvious criticism will be made that such changes will cause a certain amount of inconvenience, and it must be admitted at the outset that this is so. On the other hand, a few hours' work in the taxonomy of any group will soon show that this inconvenience is nothing to the deadlocks that arise from the slipshod and incorrect use of names. The common remark that "everyone knows what so-and-so means" is not merely untrue, for the original describer of the species would not know, but it is frequently a flimsy excuse for avoiding the work necessary to justify the employment of a correct terminology. Furthermore, it becomes impossible to discuss such topics as the comparative anatomy, systematic relationship, and distribution of the members of a large group of animals unless one can be more or less certain of the species involved. Wherever changes from the common usage have been made, the reasons for so doing have been briefly given and a synonymy provided.

My friend Professor Dakin handed the collection over to me for examination, and I wish to offer him my sincere thanks not only for so doing but also for giving the colour-notes mentioned above. I also desire to thank the authorities of the British Museum—in particular, Mr. G. C. Robson—for the privilege of working at the Museum, where ready reference to books and specimens greatly facilitated my work; and, lastly, also Professor Dendy, F.R.S., of King's College, London, in whose laboratories the dissections, preparations of the radulæ, and the drawings were made.

All the drawings of teeth were made with the camera lucida from my own preparations. Type-specimens, examples of all the species, and, when present, the radulæ have been deposited in the British Museum.

#### Order **OPISTHOBRANCHIATA** H. Milne-Edwards, 1848.

The **Gastropoda** belonging to the class **Euthyneura** are all hermaphrodite and characterised by the detorsion of their visceral mass and nerve-commissure; in addition, they generally have two pairs of tentacles and exhibit a tendency, sometimes marked, to concentration of the nervous system. They fall fairly naturally into two orders—the **Pulmonata**, which are adapted for aerial respiration and life on land, and the **Opisthobranchiata**, which are adapted for aquatic respiration and a marine life. The **Opisthobranchs** thus come to form a well-defined group; on the other hand, however, the division of this order is not quite so simple.

Certain authorities—*e.g.*, Bergh (14 & 17), von Jhering (52 & 53)—recognise three sub-orders: namely, the **Tectibranchiata**, the **Nudibranchiata**, and the **Ascoglossa**. The last-named sub-order is characterised *inter alia* by the possession of a uniseriate radula with teeth of a special form which, when worn out, are not ejected, but retained in a sac lying at the base of the buccal apparatus [hence *Saccoglossa* von Jhering (52)]. The difficulty in accepting this classification lies in the fact that the *Ascoglossa* undoubtedly contain two separate groups—(1) the *Lophocercidæ* (*Lobiger* and *Lophocercus*), which show certain marked affinities with the Tectibranchs, so that by some authorities they are included with them, and (2) the *Hermæidæ*, *Phyllobranchidæ*, *Placobranchidæ*, *Elysiidæ*, and *Limapontiidæ*, which are undoubtedly more nearly related to the Nudibranchiata. Eliot (40), to overcome this, places the *Lophocercidæ* with the Tectibranchs and the remaining families with the Nudibranchs. While this avoids one difficulty it creates another, for it does not sufficiently mark off these *Ascoglossan* forms, which deserve some recognition. Vayssière (73) includes the *Lophocercidæ* (*Oxynœidæ*) with the Tectibranchs and the remaining families he groups as a separate sub-order—the *Ascoglossa*, allied to the Nudibranchs. This restricts the application of the term *Ascoglossa* to the forms allied to the Nudibranchs, and excludes from it the *Lophocercidæ* which are included under the older and original usage of the term and which are, of course, *Ascoglossan*. Pelseener (65) has but two orders in the **Opisthobranchs**—the **Tectibranchia** and **Nudibranchia**. The latter he divides into four Tribes, of which the fourth (the **Elysiomorpha**) is identical with the *Ascoglossa* of Vayssière. While agreeing that the *Elysiomorpha* constitute a group of forms related to the Nudibranchs, I cannot accept Pelseener's view that they are highly specialised *Eolidomorpha*. Indeed, for a number of reasons that need not be entered into here, I am inclined to think that if there is any relationship between the *Elysiomorpha* and *Eolidomorpha* it is the reverse of this, and the former are to be regarded as the more primitive and not the derived group.

The difficulty remains, and further work on the doubtful and transitional forms will be necessary before it can be satisfactorily settled. For the purpose of the present paper it is intended to adopt the classification set forth by Vayssière in 1885 (73) and to divide the order **Opisthobranchiata** into three sub-orders—namely, the **Tectibranchiata**, the **Ascoglossa**, and the **Nudibranchiata**, using the term *Ascoglossa* in the restricted sense as identical with the *Elysiomorpha* of Pelseener.

#### Sub-order TECTIBRANCHIATA Cuvier, 1817.

The Tectibranchs are characterised generally by the possession of a lateral or dorso-lateral gill (ctenidium) on the right side, protected by a fold of the mantle; usually a shell, internal or external; a radula, whose used teeth are

discarded. The asymmetrical position of the ctenidium involves also a certain asymmetry of the viscera that is not characteristic of the Nudibranchiata.

The main sub-divisions employed here are those suggested by Fischer in 1884 (41) and adopted by Vayssière (74) and Pilsbry (67) among others, and the sub-order is split into three divisions : (1) *Cephalaspidea*, (2) *Anaspidea*, and (3) *Notaspidea*. Three of the species in the collection belong to the second group (the *Anaspidea*) and fall within the one family (the *Tethyidæ*). The other belongs to the last group, the *Notaspidea*.

(2) **TECTIBRANCHIATA ANASPIDEA** Fischer, 1884.

Tectibranchs that lack a fleshy head-shield ; the head possesses two or four folded or split tentacles ; the shell is spiral or plate-like, usually hidden by mantle, and with a posterior terminal nucleus, rarely absent ; the penis is near right anterior tentacle, the female aperture and vas deferens open near gill.

Family TETHYIDÆ (APLYSIIDÆ).

The animal is elongate ; the shell is in the form of an uncoiled concave plate, almost or entirely hidden, or absent ; the neck and head are narrower than the body, the mouth is a vertical fissure ; the epipodia or pleuropodia are recurved over back, forming two lateral or dorsal lobes enclosing mantle and gill. The genital orifice lies within dorsal slit, communicating by a long furrow with the invertible penis, which lies near the anterior right tentacle ; the mouth is armed with horny jaws ; the multiseriate radula possesses similar teeth ; the stomach is armed with cartilaginous nodules ; the anus is situated behind the gill.

The name generally used for the family is *Aplysiidæ* from the generic name *Aplysia*, but Linnæus in his tenth edition, 1758, uses the term *Tethys* for an animal which he briefly defines and refers to a figure in Rondelet, and this is beyond doubt the ordinary sea-hare usually referred to now as *Aplysia*. Later, in the twelfth edition, 1767, he applies the term *Aplysia* or *Laplysia* to the very same creature, and uses the name *Tethys* for the Nudibranch commonly known as *Tethys fimbria*. Pilsbry has dealt fully with this matter (66), and points out, quite correctly, that the term *Tethys* is the proper one for this genus and not applicable to Nudibranchs. He adopts this nomenclature in his monograph (67, p. 59), but strangely enough retains the old family-name *Aplysiidæ*, whereas the family should take its name from the oldest or typical genus of the family. The correct family-name, however, is used by Hedley (50, p. 107), 1918. There is no doubt that Pilsbry was right in making this change, and the genus is *Tethys* with *Aplysia* as a synonym. It is to be regretted that earlier writers did not go back to the original literature, but continued to use the word *Aplysia* and misapply the term *Tethys*.

## Genus TETHYS Linn. 1758.

Type by designation, *T. leporina* Linn. ; *T. limacina* Linn.  
being unidentifiable.

Synonymy: APLYSIA Linn., 1767, and subsequent authors.

Type, *Laplysia depilans* Linn.

The animal is swollen behind, narrower in front, with rather a long neck and head, bearing folded tentacles and slit rhinophores as is usual in the family; the latter lie about midway between tentacles and dorsal slit. The pleuropodia arise in front of the middle of the animal's length, are ample, freely mobile, free throughout their length or united for a distance behind. They are functional as swimming-lobes; their anterior ends are separated. The mantle nearly covers the gill, having a median tube, foramen, or orifice communicating with shell-cavity, and produced behind in a more or less developed lobe or lobes, folded to form an excurrent siphon. The genital orifice lies under the front edge of the mantle, in front of the gill; an opaline gland is present a short distance behind the genital opening. The foot is well developed. The shell is very thin and membranous with a thin calcareous inner layer; it is nearly as large as the mantle, concave, with pointed small apex, bears a recurved lamina, and has a concave posterior sinus.

I am aware that it is an extremely difficult matter in certain cases to identify members of the genus *Tethys* by their shells, which are on the whole very similar, but the two following species have been placed under the same names as previously recorded, but poorly described, forms. This has been done because I have had the opportunity to examine the type-material and in neither case have I been able to detect significant differences between the present and the previously described species. Further, the localities are in each instance sufficiently near to make it probable that they fall within the limits of the distribution of the respective species. Literature, moreover, is strewn with *nomina nuda* due to the multiplication of names founded upon unsatisfactory descriptions or without sufficient notice of previous work.

Species TETHYS GIGANTEA (Sowerby), 1869, Conch. Icon. vol. xvii., *Aplysia*, pl. 1, sp. 1, fig. 1 a & b. (Pl. 27. fig. 1. Pl. 29. figs. 20-22.)

*Body.* The animal is very large, quite justifying its name of *gigantea*, and its body is plump, high, and somewhat egg-shaped. The visceral hump is placed relatively far back in the largest part of the body, which narrows and gets lower as it passes forwards to the cephalic region. The very well-developed pleuropodial lobes arise a short distance behind the rhinophores, are freely and widely separable, and unite posteriorly to form a transverse fold across the hinder end of the body above the short but well-marked caudal prolongation of the foot. The moderately thick mantle is perforated by a small aperture over the centre of the shell. It covers the ctenidium, save for a narrow strip postero-laterally, but more completely than in the

next species. The anal funnel is strongly marked and protrudes between the hinder margins of the pleuropodia on the right side of the middle line. The integument is soft and smooth, but thrown into a series of raised areas of irregular sizes and shapes, separated from one another by deep narrow grooves. The whole animal, more particularly in lateral aspect, presents a very characteristic appearance, recalling to some extent the appearance of crocodile-hide, but, as just noted, it is quite soft.

The opaline gland occupies a well-defined region below the right anterior part of the mantle. It opens to the mantle-cavity by a very distinct, circular or slightly crescentic, single aperture and not by a series of apertures as in *T. punctata*.

*Colour.* The colour of the preserved specimens is a very deep brownish grey with black lines running in many of the cracks, but also forming areas of interlacing tracery under the pleuropodia and in the caudal region. Professor Dakin informs me that in life the animal was of a deep opaque purple-green.

*Dimensions.* The larger specimen measured, in the preserved condition, 15 cm. long by 6.5 cm. wide and 6 cm. high, but of course would have been much larger in life, as all these animals shrink considerably when preserved. Judging from the type-shells named by Sowerby, one of the original specimens must have been at least a half or two-thirds as large again. If we take the estimate made by Eales (33, p. 12) that when preserved *T. punctata* rarely measures "more than a third of its length when alive," and assume it to apply to *T. gigantea*, we see that it is possible that the present species may reach a length of about 60 cm. (say, 2 ft.).

*Head.* The head and neck-region of this form are quite well developed, although noticeably smaller than the body of the animal. The vertical slit-like mouth has a large auriculate tentacle on each side. These cephalic tentacles do not meet in the mid-dorsal line above the mouth, but an extension of each forms a sort of lateral flange passing on each side of the mouth. The postero-dorsal border of each tentacle is rolled, so as to form a very conspicuous groove facing backwards and outwards. Below and completely hidden by the right oral tentacle is the penis.

*Foot.* The foot is well developed, broad, and muscular. It is not sharply marked off from the pleuropodial lobes laterally, and in the larger specimen its surface presents the same "crocodile skin" pattern as the sides of the body. At the anterior end it is separated from the head by a well-marked groove, and it is expanded into large semicircular lobes which meet across the anterior end. This is present in both specimens, but much more marked in the large one, where this frontal expansion of the foot projects laterally almost the width of the head beyond it on each side. The hinder end of the foot has a similar, but much smaller, expanded lobe borne on each side of the caudal prolongation.



*Rhinophores.* The rhinophores, although considerably smaller than the oral tentacles, are very obvious cylindrico-conical structures lying close together in the dorsal region about halfway between the oral tentacles and the beginnings of the pleuropodia. Their terminal portion takes the form of a fairly thin flap folded upon itself so as to produce a deep groove facing laterally.

*Gill or Ctenidium.* The large gill is crescentic in shape and forms a lobate plume. The anterior portion is attached by a wide base along the pallial cavity and the posterior end is free. Just the edge of the hinder portion protrudes from beneath the mantle.

*Shell.* The shell is transparent, very thin and soft, and of a pale horn-yellow colour. The concentric lines of growth are clearly visible. That of the smaller specimen measures 62 mm. by 41 mm. The shell of the larger specimen was considerably larger, but left intact. The largest of the Sowerby shells in the British Museum was 96 mm. by 79 mm., but it is very dry and shrivelled.

*Labial Armature.* The wall at the hinder end of the buccal cavity is lined by a thin semi-transparent cartilage-like membrane; this takes the form of a compressed tube, whose diameter is 9 mm. high and 4 mm. at its widest point and about 5 mm. long. This is strengthened by two flat cushion-shaped bands, 3.25 mm. wide, of a deep brown colour. They almost touch dorsally, but are slightly more widely separated at their ventral ends. Under the microscope it will be seen that these bands are composed of an enormous number of tiny cylindrical rods with rounded ends, closely packed together to form a sort of "pile" as in velvet. In some works these bands are spoken of as "jaws," but this is not a good term, as they cannot be considered as either homologous in structure or analogous in function with the jaws of Nudibranchs.

*Radula.* The radula is very well developed, and in the smaller of the two specimens measured 15.5 mm. long by 14.5 mm. wide. The total number of rows in the radula was from 83-85. The number of teeth in the various rows was as follows: in the first row 5 (*i. e.*, 2.1.2); in the tenth row 15 (*i. e.*, 7.1.7); and in the seventeenth row about 119 (*i. e.*, 59.1.59). The rachidial tooth is large and consists of a basal plate in the form of a trapezium with a deep notch in the middle of the anterior edge and a leaf-shaped blade. The blade has a broad median denticle with 3 or 4 lateral spines increasing in size towards the base and the two lateral smaller denticles each flanked by one or two spines. The bases of the inner pleurals are roughly rhomboidal with curved sides. The blade contains two main denticles, of which the inner is larger and has 5-6 lateral spines. The outer has 3-4 laterals, the basal one being larger than the others. The pleurals increase in size towards the outside, reaching their maximum more than halfway out. Here they are much longer and the two denticles are very large and almost smooth—

they have a very thin crenulated edge along their basal portions. The teeth decrease in size rapidly at the margin, and the last one or two consist of a single elongated basal plate with no spine.

The conspicuous genital aperture is to be found just in front of the anterior edge of the mantle to the right of the middle line. The seminal groove is well marked and passes forward around the outside of the right rhinophore to the penis underneath the right cephalic tentacle.

The anus lies on a fold of the mantle to the right of the middle line behind the visceral hump. In this region the mantle is somewhat thickened and produced to form an anal funnel which projects beyond the pleuropodia.

*Notes.* Two specimens were obtained from near Fremantle (some 250 miles south of the Abrolhos region), and as Sowerby's specimens were also from "Swan River" the present ones can probably be regarded as topotypes.

Species TETHYS DENISONI (Smith), Rep. Zool. Coll. 'Alert,' p. 89 (1884).  
(Pl. 27. fig. 2; Pl. 29. figs. 23-25.)

*Body.* The body is plump, high, and somewhat egg-shaped, being wider at the hinder end than at the front end, and it passes forwards into a narrower head or cephalic region. The visceral hump appears to be thrown rather far back as compared with *T. (Aplysia) punctata*. The pleuropodial lobes arise laterally about as far behind the rhinophores as those are behind the oral tentacles; they are moderately large and freely separable. Posteriorly they unite and form a sort of transverse flange across the hinder end of the body above the caudal prolongation of the foot. The mantle covers the shell, but possesses a small central perforation, and it also largely covers the ctenidium, which is free for a short distance at its postero-lateral end. The anal funnel is well developed. The integument covering the whole animal is very smooth, but thrown into wrinkles.

The opaline gland is a well-defined body lying under the right anterior portion of the mantle and opening to the mantle by a single fairly large pore and not by a series of apertures as in the European *T. punctata*.

*Colour.* When preserved the animals are of a pale greyish white and the wrinkles are often black, very similar to those in *T. gigantea*. Professor Dakin informs me that in life they are of an olive-green colour with some darker mottlings.

*Dimensions.* The largest specimen when preserved measured 6 cm. long by 3 cm. wide and 3.2 cm. high.

*Head.* This may be regarded as including the head and neck. The mouth is terminal and takes the shape of a vertical slit; on each side is a fairly large auriculate tentacle. These pass down on each side of the mouth, and at their upper border are curled round to form a groove directed posteriorly and outwards. They are separated in the mid-dorsal line and show no

tendency to fuse and form a sort of veil as in *T. punctata*. Below and in front of the right oral tentacle lies the penis.

*Foot.* The foot is large and muscular and fairly broad. It is sharply marked off from the head at the anterior end by a groove, and posteriorly it is continued as a sort of tail. The pleuropodia arise as dorsally-directed flaps from the median and postero-lateral region of the foot.

*Rhinophores.* The rhinophores are two sub-conical projections about 12 mm. high, situated near the mid-dorsal line about halfway between the oral tentacles and the front end of the pleuropodia. They are deeply grooved along the terminal portion of their postero-lateral borders.

*Gill or Ctenidium.* The gill is well developed and is a lobate plume of crescentic shape. It is attached by a wide base along the antero-median margin of the pallial cavity, and posteriorly it passes out freely and the tip is exposed to a relatively greater extent than in the preceding species.

*Shell.* The shell is pale yellow, transparent, with concentric lines of growth clearly showing, and it measures 28 mm. by 25 mm. (Smith's specimen measured 30 by 27 mm.—a fairly close approximation). The postero-dorsal umbo lies far back on the visceral mass. On the longer, more arched, left side of the shell lie a ridge and a groove which run parallel with the edge.

*Labial Armature.* The inner parts of the buccal cavity are lined by a thin hyaline layer of cartilaginous consistency. This takes the form of a tube flattened laterally; its internal dimensions are 5.75 mm. high by 1.5 mm. at its widest point and it is about 4 mm. long. It is strengthened by two slightly raised bands 2.5 mm. wide; these almost touch dorsally, but are a little more separated ventrally. As in the preceding species they are composed of an enormous number of tightly packed circular rods.

*Radula.* The radula is well developed and measured 12.5 mm. long by 10.5 mm. wide when spread out on a slide. It is of a deep horn-yellow colour. The number of rows in the radula is about 48 and the number of teeth in the first row 3 (*i. e.*, 1. 1. 1); in the tenth row 45 (*i. e.*, 22. 1. 22); and in the thirty-fifth row about 87 (*i. e.*, 43. 1. 43). The base of the rachidial tooth is roughly trapezoidal, with a deep rounded notch in the middle of the anterior border. The blade is leaf-shaped and relatively larger than in *T. gigantea*. It has a median spine bearing 3-4 lateral denticles and two lateral spines. The first of these has two lateral denticles and the other is smooth. The base of the first pleural tooth is approximately rhomboidal with curved sides; its blade consists of two well-marked spines, the larger on the inside, and each bears a series of from 2-4 flanking denticles. The pleural teeth get larger as they pass outwards, reaching their maximum well over halfway out. The blade becomes elongated and the spines much longer, but they retain their lateral denticles, about 3-5 in number. Finally, near the lateral margin, first the smaller spine disappears and then

the larger, so that the last two or three teeth consist simply of a narrow oval basal plate. All the types of teeth differ from the corresponding ones in *T. gigantea*.

The genital aperture lies a little to the right of the middle line, just under or very slightly in front of the anterior edge of the mantle, and from it the quite distinct seminal groove passes forwards to the penis, which, as noted above, lies just in front of and below the oral tentacle.

The anus is situated at the hinder end of the visceral hump, practically in the mid-dorsal line and a short distance away from the hump, upon a fold of the mantle. In the neighbourhood of the anus the mantle is thickened and projects outwards in the form of a flap, which is coiled round in such a manner as to form a funnel, the anal funnel, which in this species is relatively larger than in *T. punctata*.

*Notes.* In all, five specimens of this species were obtained: two large ones about the same size from Wooded Island, two smaller ones with no exact locality given, and one quite small one from Pelsart Island. Professor Dakin in his paper on the Abrolhos (32, p. 170), when dealing with Wooded Island, makes the following reference, presumably to this species: "Nudibranchs and Tectibranchs (*Aplysia* sp.) were extremely common. We could have obtained hundreds of specimens of *Aplysia* by merely picking them up as we waded in the shallow water."

Smith (70, p. 89) described a form *Aplysia denisoni* collected by H.M.S. 'Alert' in the following manner:—

"Body (in spirit) high, exhibiting a distinct pedal disc, produced posteriorly into a caudal termination. The entire surface dirty whitish, black-veined in the wrinkles (? stains only). Mantles-lobes moderately large, commencing in front some distance behind the posterior tentacles and terminating a little in advance of the cauda. Anterior tentacles large, cylindrical, with the apical slit not extending halfway down the outer side, placed a little nearer the oral tentacles than the beginning of the mantle-lobes. Eyes minute, situated near the outer anterior base of the tentacles. Shell very thin, straw-colour, 30 mm. long and 27 broad. Animal about three inches in length in its contracted state."

This description, while not very exact, applies closely to the present specimens. It was, however, of an animal obtained from Port Denison, Queensland, and I should have hesitated to regard it as identical, had it not been possible to examine the original type-specimen in the British Museum. Smith's specimen, much discoloured by age and not well preserved, and the shell, dried and somewhat shrivelled, are still available. Taking into account the difference in condition of the specimens, I can see no way of distinguishing between them, and so I have placed the present forms under Smith's name, although they come from fairly widely-separated areas.

Genus *DOLABRIFERA* Gray, Proc. Zool. Soc. London, p. 162 (1847).

Type by tautonomy and designation:

*D. dolabrifera* Rang, Hist. Nat. Aplys. p. 51, pl. 4. figs. 1-6, ex Cuvier, Règ. Anim. (edit. i.) ii. p. 398, "1817" for 1816 (name only).

Synonymy: *DOLABRIFER* Fischer, Man. Conchyl. 1883, p. 568.

The general form is ovate-oblong or sack-like, tapering towards the tail. Tentacles and rhinophores are slit and expanded distally, the latter lie nearer to the front margin than to the dorsal slit. The eyes are as in *Tethys*. The pleuropodial lobes arise far behind the middle of the length, are contiguous, scarcely mobile, united behind, and enclose a large gill-cavity; the dorsal slit is short. The mantle is small, not perforated over the shell, nor covering much of the gill. The foot is broad, often expanded at the edges. The genital pore lies in front of the gill, under the mantle-edge. The shell is small, not spiral, solid and calcareous, and sub-triangular, trapezoidal or irregularly oblong; the apex is projecting and calloused, with no spiral tendency. The radula bears large sub-triangular rachidial teeth, with several denticles on the cusp, and the lateral teeth possess long, coarsely denticulate cusps.

Species *DOLABRIFERA PELSARTENSIS*, sp. nov. (Pl. 27. fig. 3; Pl. 29. figs. 26-28.)

*Body.* The body is oblong-ovate, reaching its maximum width behind the middle and passing backwards to a bluntly pointed tail. The back is arched and the whole integument is wrinkled, and bears a series of wart-like pointed projections. The pleuropodial lobes take their origin towards the middle region of the body; they are not easily movable, and are separated by a slit lying slightly to the right of the mid-dorsal line and mainly in the posterior half of the animal's length. At the anterior end the lobes are practically contiguous, but separated by the narrow genital groove. Within the gill-cavity, the mantle entirely covers the shell and is not perforated; it only covers a small part of the gill.

*Colour.* The colour of the preserved specimens is of a uniform dirty brownish grey, and Professor Dakin informs me that the living animals were much the same colour, but of a deeper warmer brown.

*Dimensions.* The larger specimen measured 32 mm. long by 9 mm. wide, and 8.5 mm. high.

*Head.* The head is relatively small and the front of it is occupied by the vertical slit-like mouth. It is separated from the front end of the foot by a groove. Antero-laterally it bears two split auriculate oral tentacles. The tiny eyes lie just in front of and outside the rhinophores. In the larger of the two specimens the head is practically withdrawn into the body.

*Foot.* The muscular foot is well developed and broad. At the anterior end it is bluntly rounded and, as noted, separated from the head by a transverse groove. Posteriorly it narrows off and terminates in a blunt point.



*Rhinophores.* The two rhinophores lie fairly close together, dorsally, just behind the oral tentacles and nearer to them than to the slit between the pleuropodia. Their extremities are grooved postero-laterally, but they are not so dilated as in some members of the genus.

*Gill or Ctenidium.* The gill is composed of a single lamellated plume with the lamellæ lying longitudinally, and it runs more or less transversely across the animal.

*Shell.* The shell was very small, calcareous, and apparently trapezoidal, but was too crushed to allow of accurate description.

*Labial Armature.* The labial armature, if present at all, is only very feebly developed.

*Radula.* The radula is not large, but the teeth are well developed. The total number of rows is 31. The first row consisted of 2 (*i. e.*, 1.1.0), the fifth row of 27 (*i. e.*, 13.1.13), and the twenty-fourth of 57 (*i. e.*, 28.1.28). The rachidial tooth has a broad trapezoidal basal plate, which is incurved on both its anterior and posterior edges. The blade consists of a median spine bearing two tiny laterals, and four smaller but almost equally developed spines lie on each side of this. The basal plate of the inner pleurals is rhomboidal with incurving long sides, and the blade consists of four large spines of which that nearest the rachis is usually the largest. Further out the spines become extremely large, and the one nearest the rachis much the largest, so that the others are borne on its outer side. The outermost pleurals still have a large inner spine, but the next one to it is almost as well developed, and so they appear bifid.

In general, the teeth are somewhat similar in type to those of *Tethys*, but they differ sufficiently to be recognised as of a different genus.

The genital aperture lies under the mantle-edge well in front of the gill. The seminal groove passes forwards to the penis, which is situated just below the right cephalic tentacle.

The anus opens on the right side of the middle line behind the gill.

*Notes.* The two specimens in the collection were both collected on Pelsart Island.

They do not appear to be referable to any previously described forms, and so have been recorded here as a new species with the name *Dolabrifera pelsartensis* from the island on which they were taken.

### (3) TECTIBRANCHIATA NOTASPIDEA Fischer, 1884.

The mantle is well developed and covers the whole dorsal surface. It contains a somewhat small concave lamellar shell within a large pallial cavity. The shell may be absent or may itself be hidden by an external shell. The oral veil is marked and carries two dorsal tentacles (rhinophores). The gills are pinnate and situated laterally on the right side of the body.

## Family PLEUROBRANCHIDÆ.

The Pleurobranchidæ have not the large head-sheath of the Bullidæ nor the large parapodia of the Tethydæ. They have a well-developed oral veil on a head marked off from the body. The oral tentacles are only moderately developed and cleft; the rhinophores are usually considerably larger and are deeply cleft longitudinally. The back is covered with a thick or a thin mantle and this generally projects freely over the head anteriorly and over the tail posteriorly. Within the mantle is a more or less large shell (absent, however, in *Pleurobranchæa* and *Oscaniopsis*). A single (in *Oscanius* double) genital aperture lies at the front end of the right side of the body. Above or below this, but still anterior to the gill, is a prebranchial opening or papilla leading into a sac. The gill is frequently tripinnate, and below it lies the urinary aperture. At the hinder end of the strand of tissue attaching the gill (the gill mesentery) lies the anus (in *Pleurobranchæa* it is above the strand). The foot is moderately large and overhung by the mantle (save in *Pleurobranchæa*, where it passes over into the side and back of the body). The sole of the tail-region of the foot often bears a gland.

Genus BERTHELLA Blainville, Man. de Mal. et Conch. 1825, p. 469.

Type by monotypy: *B. porosa* Blainville, *ibid.* = (*Bulla*) *plumula*  
Montagu, Testacea Brit. i. 1803, p. 214, pl. 15. fig. 9.

Type, therefore, *B. plumula* (Mont.).

Synonymy: CLEANTHUS Leach, Synop. Moll. Gt. Brit. 1852, p. 28.

{PLEUROBRANCHIUS (*pars*) Bergh, Malak. Unters. 1898, p. 117.

The shell is haliotidiform, fairly tough, and shows lines of growth and also longitudinal striæ which, while faint, are nevertheless clearly visible. It is of a translucent amber-yellow colour.

The animal is plump and oblong; the mantle covers the whole body, its margin is entire, its front and hinder ends rounded, and it is separated from the foot by a deep groove. The gill is bipinnate and of moderate size. The two dorsal tentacles or rhinophores are inserted side by side between the mantle and the oral veil, and are auriform and deeply cleft. The foot is truncated anteriorly and bluntly rounded posteriorly where it projects slightly beyond the mantle. The labial armature is composed of two plates, each built up of a large number of irregularly arranged close-fitting spine-like pieces of chitin. The radula is well developed, without a rachial tooth and the numerous pleural teeth have the form of knife-like blades bearing denticles at their distal extremities.

Species BERTHELLA PLUMULA (Montagu), Test. Brit. i. 1803, p. 214. (Pl. 29. figs. 29 & 30.)

*Body.* The body is an elongated oval and slightly flattened. The mantle is well developed and overhangs the body all round, save for a narrow strip at the hinder end. The oral veil also projects in front of the mantle.

*Colour.* The colour of the preserved specimen is a translucent yellow-grey, and Professor Dakin informs me that, in life, it was of a uniform dull yellow colour.

*Dimensions.* The preserved example measured 22 mm. long by 14 wide and 9 mm. high.

*Head.* The head is flattened and covered by the forward extension of the mantle. It bears a strongly developed oral veil, and this is continued out laterally into two short triangular expansions, which represent the oral tentacles and are deeply cleft along their lower outer edge. The mouth is a round opening under the head, and between it and the anterior extension of the foot.

*Foot.* The foot is well developed, and, although fairly broad, it is overhung along the sides of the mantle, but probably the posterior end is free during locomotion. The anterior end is abruptly rounded and carried on beyond the mouth as a shallow flange, and the posterior end is bluntly pointed.

*Rhinophores.* The rhinophores are well-developed cylindrico-conical structures lying under the front end of the mantle at the hinder dorsal region of the head. They arise practically touching one another in the middle line, but diverge slightly as they pass forwards and they are deeply sulcate on their outer margins. Just behind the base of each a well-marked, dull black eye-spot shows through the skin of the neck.

*Gill.* The gill is situated well forward on the right side of the body under the mantle. It is attached at the front or basal end and passes backwards as an elongated pyramidal structure, bearing about 24 lamellæ on each side of a smooth rachis.

*Shell.* The shell was, unfortunately, too damaged to admit of accurate description, but it appears to be very similar to that of *Berthella* [*Pleurobranchus*] *plumula* as described and figured by various authors.

*Labial Armature.* The labial armature consists of two oblong plates measuring 3 mm. long by 1.5 mm. wide. They are of a horn-brown colour and are composed of tooth-like elements. Each consists of a lanceolate flattened blade coming to a single, sharp, non-denticulate point, and bears, some way down on each side, a blunt triangular process, but these two projections are not opposite to one another. The elements agree with those figured by Bergh (27) and Vayssière (75).

*Radula.* When flattened on a slide the pale yellow radula measured 4 mm. by 2 mm. It has no rachidial teeth and the pleural teeth are arranged in 78-82 rows; a typical row contains 280-290 teeth and the formula is (140-145).0.(140-145). The teeth increase in size from the rachis outwards, reaching their maximum well beyond the middle line; they then decrease slightly, but the outermost teeth, although slender, are still longer than the innermost. All the teeth are of very similar shape and stand practically upright. They have a small base, from which comes off a long

thin curved spine like the blade of a knife. At its distal extremity it bears a set of saw-like denticulations on one side, over about one-third or one-half its length. These vary in number from tooth to tooth from 7-14 and are of different sizes on the same tooth.

The genital and prebranchial apertures lie immediately in front of and below the insertion of the gill. The anus is situated just at the hinder end of the gill-mesentery.

*Notes.* This species is represented in the collection by a single specimen from Sandy Island.

Cheesman (30) has described a form, *Pleurobranchus* (perhaps *Berthella ornatus*, from New Zealand, but it differs from the animal here described in having brownish mottlings on the back and dark brown rhinophores. Unfortunately, details of the radula and labial armature are not given.

According to Bergh (27) the radula of *B. [Pleurobranchus] plumula* has 100 rows of teeth 150 in a row, or, again (26), the radula is stated to contain 120 rows with about 220 in the row, but it is not clear whether the 150 and 220 in these descriptions refer to the number of pleural teeth on one side of the radula or on both. Vayssière (75), however, while he does not state the number of rows in the radula, gives the formula as 140-155. 155-140, which agrees quite closely with that of the present specimen. The form of the teeth also falls within the limits of the variations figured by different authors for this species. The radula, therefore, appears to be somewhat variable in constitution.

The labial armature, as a whole and in its individual elements, and also the shell, as noted above, agree with previous descriptions. It would appear, then, that the present specimen belongs to the species *B. plumula*, although, if the agreement were not so close, I should hesitate to refer it to that species on account of its locality. *B. plumula*, however, had previously been recorded from Norway, Great Britain, France, Portugal, the Azores, the Mediterranean, and Lower California, so that it is of wide distribution.

#### Sub-order ASCOGLOSSA Bergh, 1876.

(Saccoglossa von Jhering, 1876; Elysiomorpha Pelseneer.)

Branchiæ or gills are absent or poorly developed. No shell is present. The pharynx is mainly adapted for sucking and does not possess jaws. The radula is short, uniseriate, and has teeth of a characteristic shape, which, when no longer required, are passed down into a sac or ascus lying at the base of the pharynx. The central nervous system is composed of 6 or 7 ganglia massed around the œsophagus. The otocysts contain only a single otolith. Two seminal vesicles are usually present. The penis is often armed with a spine.

## Family PLACOBANCHIDÆ.

The head is flattened, and passes over laterally into short leaf- or ear-shaped tentacles, which have their lateral margins rolled. The two closely set eyes show through the skin of the neck. The body is much flattened and its sides or mantle-folds expanded into wing-like flaps (these are not epipodial developments as in *Tethys*), which are usually held up over the body. Behind the neck is a noticeable swelling, the pericardial swelling containing the pericardial cavity and the kidney, and at the right side of this lies the anus. The dorsal surface of both body and lateral expansions generally bears a series of low longitudinal folds or lamellæ. The foot is not sharply marked off from the body, its edge projects very slightly, and often its anterior end is bilabiate.

There are no jaws; the radula is short, uniseriate, and has large teeth. These, when worn, are shed into the inferior radula-sac. The stomach is short and sac-shaped. The hermaphrodite gland is not discrete, but in the form of isolated follicles. The penis is protrusible and armed with a curved spine.

Genus PLACOBANCHUS van Hasselt, Alg. Konst en Letter-Bode,  
1824, I. Deel, no. 3, p. 34.

Type by monotypy, *P. ocellatus* v. Hass.

The head is flattened, with a broad front, which bears on each side a short leaf-like or auriform tentacle whose side-margin is rolled. Two eyes, set close together, lie on the neck. The body is much depressed and bears two wing-like lateral expansions; these are mantle-lobes belonging to the body and not epipodial appendages as in *Tethys*; they are usually turned up over the body. Behind the neck is a fairly large pericardial swelling, on the right side of which lies the anal aperture. The upper surface of the body and the mantle-lobes bear numerous, longitudinal, parallel, low folds. The double genital aperture lies behind the right tentacle. The foot is not distinctly marked off from the body, anteriorly it is divided by a transverse groove into two equi-sized lips.

The bulbus pharyngeus is much as in Phyllobranchia. The radula is short and uniseriate, the teeth are large and persistent and passed on into an inferior sac. The penis is armed with curved spines.

Species PLACOBANCHUS EXPANSA, sp. nov. (Pl. 27. fig. 4; Pl. 29. figs. 31-34.)

*Body.* The body of this form is extremely flat and somewhat elongated. It passes out without a sharp line of demarcation into the enormously developed mantle-lobes which project, as leaf-like expansions, many times the width of the body and are continuous behind with the posterior end of the body. The whole animal presents the appearance of a flat leaf slightly thickened in the



middle anterior region. It is usual in this genus for the mantle-folds to be folded over the dorsum, but there was no suggestion of this in the present species. Indeed, these lobes are much more developed than in other members of the genus and if folded would far more than overlap. Also their antero-lateral corner projects well in front of the head, so giving the animal a characteristic appearance not found in other members of the genus.

*Colour.* The colour of the preserved specimen is a light brownish fawn with a large number of tiny black spots scattered irregularly all over it, and the mantle-margin is bordered all round with a black line about 1 mm. wide. Professor Dakin informs me that in life the colour was more of a greenish fawn with the black markings as in the preserved specimen.

*Dimensions.* The length along the middle line was 23 mm., but the antero-medial corners of the mantle projected about 1.5 mm. in front of this. Width across the widest point was 21.5 mm.

*Head.* The head is flattened and abruptly rounded at the anterior end. On each side is a flattened auriculate tentacle rolled at the lateral margin. In the specimen the head was somewhat retracted.

*Foot.* The foot is practically indistinguishable, being represented simply by the thickening in the antero-medial line on the ventral side. It is so reduced that it suggests that the animal was incapable of creeping.

*Branchiae.* None.

*Radula.* The radula is short and uniseriate; it contains 12-14 teeth. The tooth has an oblong base with rounded corners, and the upper portion is carried on as a long, stout, slightly curved, non-denticulate, almost conical spine. The bases of the teeth are closely approximated, so that each spine overlaps the whole of the base of the tooth immediately in front of it, and about half the next also. The spines lie down upon the succeeding tooth, which is slightly hollowed to receive them, save in the front tooth, which is almost upright and appears to be the only one in use.

The dental sac contained twenty or more discarded teeth. Some of these are quite small, not a quarter of the length of that in use, so that it would appear that they are carried for a relatively long period of time.

*Notes.* But one specimen is represented in the collection, obtained from the shore of Wooded Island.

While it is here referred to the genus *Placobranchus*, it is, as noted above, different from the previously described members of the genus in the following points:—

(1) It has non-denticulate teeth. (2) It has a relatively much greater extension of the mantle-lobes. (3) It has forward extensions of these lobes. Rather than make a new genus, however, it is included here, since in other points it agrees closely with the previously known members.

The large expansions of the mantle and almost total lack of a foot rather suggest that it may be a swimming form. The name *P. expansa* is here suggested to call attention to the large mantle-lobes.

## Sub-order NUDIBRANCHIATA Cuvier, 1817.

Nudibranchs are marine hermaphrodite Opisthobranchiata without otenidium and osphradium, and in the adult state without a shell. The larva, however, has a shell and operculum. The visceral mass is not marked off from the foot; the body shows complete or approximate external symmetry and usually bears plumes or other appendages which assist respiration. The nervous system is concentrated in a collar behind the buccal bulb, and the chief ganglia are placed on the dorsal surface of the œsophagus, being often partially united and sometimes fused into a single mass. The vas deferens is always an internal tube, never an external groove. The teeth, when used, are discharged from the body and not retained in a sac. Among the common, but not universal, characteristics of the Nudibranchiata are also the following:—(1) The dorsal tentacles or rhinophores are often laminated and retractile, features not recorded in any other group. (2) The kidney is rarely compact, but usually a system of ramified tubes. (3) The genitalia are often extremely complicated, both in their essential plan and also owing to the presence of accessory glands and armatures. Besides this, the various subdivisions show remarkable peculiarities of their own, such as the ramification of the digestive organs, the reduction of the teeth to a single row, and the presence of nematocysts.

The classification of the Nudibranchiata here adopted is essentially that of Eliot (40) with the following four main differences:—(1) The *Ascoglossa* have been removed and treated separately for reasons noted in the introduction. Eliot's family-names *Dorididæ Cryptobranchiatæ* and *Dorididæ Phanerobranchiatæ*, being binomial, cannot strictly be used, as the family must have a single name derived from that of its oldest and typical genus. Moreover, both these terms include a number of groups of forms, which, for the present at any rate, would appear to be more conveniently handled separately. It must be confessed that the classification of both these assemblages stands in need of further revision, a task outside the scope of the present work. (2) For the reasons just given the group *Dorididæ Cryptobranchiatæ* has been sub-divided into smaller families, whose limits correspond with the similarly named sub-families as given by Bergh in his 'System der Nudibranchiaten Gastropoden' in 1892. In certain cases the laws of priority have necessitated a change of name. (3) Eliot's four divisions of the *Dorididæ Phanerobranchiatæ* have been regarded as independent families. (4) Investigation of the synonyms of various species has revealed the fact that certain names are incorrectly applied, as was pointed out previously. These have been rectified by the alteration of the names in the cases that appear to admit of no doubt, and such a change sometimes involves both the names of the genus and the family, even though the limits of these groups have not been altered.

The sub-order is divided into two Tribes (A. *Holohepatica* and B. *Cladohepatica*), a separation dependent in the main, as the terms imply, upon

whether the liver remains in one compact mass or is split up and branched. The two groups defined in this way, however, are separated by other associated anatomical differences, that indicate clearly a wider gap between them than is perhaps suggested by the mere condition of the liver.

#### Tribe A. **Holohepatica.**

Nudibranchs in which the liver forms a compact mass, neither branched nor divided, and usually accompanied by the following characters. There is complete external symmetry; the vent usually lies in the mid-dorsal line and is surrounded by a circle of branchial plumes; the radula is of moderate or considerable width, save in the family Dendrodoridæ (Doriopsidæ); mandibles are rare; the hermaphrodite gland is usually spread over the liver as a layer, but sometimes forms a discrete mass; as a rule, the genital ducts are triaulic and there are two receptacula seminis.

#### Family DUVAUCELIIDÆ (TRITONIIDÆ).

The branchiæ consist of tufts set along the mantle-region or occasionally they may be absent altogether.

Genus SPHÆROSTOMA Macgill. Hist. Moll. Anim. Aberdeen, etc. (1843).

Type by monotypy: *S. jamesonii* Macgill. = *T. hombergii* Cuvier, 1803.

Type: *S. hombergii* (Cuvier).

Synonymy: TRITONIA Cuvier, Tabl. Elém. Hist. Nat. 1798, p. 387, *auct.*

NECROMANTES Gistel, Natur. des Tierr. f. Schulen, 1848, p. xi.

LIRIOPE Gistel, " " " " 1846, p. 171.

The body is limaciform, but somewhat rectangular in outline, except at the end, where it tapers to a short tail. The foot is broad. Over the mouth is an oral veil bearing two grooved tentacles at the ends, and in the middle tubercles or processes. The rhinophores are retractile into raised sheaths; they are not perfoliate, but surrounded by a few plumes. The dorsal margin is slightly prominent, and bears a single row of branchial tufts which are more or less arborescent. Anal and renal openings lie on the right side. The jaws are large, with several rows of denticles or prominences near the edge. The radula varies greatly in size in the different species, but always consists of a broadish central tooth with a moderate or large number of laterals which are usually simply hamate. The first lateral is usually larger than the others, and somewhat clumsily shaped. The liver is not divided and sends off no branches to the gills. There is no armature either in the stomach or on the genitalia. The hermaphrodite gland forms a layer over the liver (*Eliot*).

It will be noted that the name of the family is changed from Tritoniidæ Cuvier, as this name is preoccupied, and Duvauceliidæ substituted. *Tritonia* Cuvier being preoccupied has to be replaced by *Spharostoma* Macgillivray,

1843. *Duvaucelia* Risso, 1826, has to replace *Candiella* Gray, 1853, as the valid name for this genus, and thus the oldest generic name in the family becomes *Duvaucelia*, from which the family-name is derived. The matter has been fully dealt with by Iredale and O'Donoghue (51 a, p. 229), and is again referred to under the Family Euphuriæ (Polyceridæ).

Species SPHÆROSTOMA DAKINI, sp. nov. (Pl. 27. fig. 5; Pl. 29. figs. 35-40.)

*Body.* The body is oblong, limaciform, and like a typical *Sphærostoma*. It is moderately high, the back flat, and there is a slight pallial extension along the edges of the back in the line of the branchial plumes. The dorsum passes forward and out as a well-marked, strongly bilobed, oral veil, which bears about six or seven dendriform processes on each side of the middle line. The short tentacle at each lateral margin of the veil is grooved throughout its length upon the ventral side.

*Colour.* In the preserved condition some of the specimens were of a dull grey colour, and some of the same general colour but plentifully marbled with dark brown. Professor Dakin informs me that the living animal is of a dirty pinkish colour with brown markings.

*Dimensions.* The specimens varied somewhat in size, and the largest measured 88 mm. long by 25 mm. wide and 25 mm. high. The lateral margins of the oral veil project about 15 mm.

*Head.* The head is sub-globose, distinct, but not projecting, and the mouth is in the form of a longitudinal cleft. It is completely overhung by the bilobed oral veil.

*Foot.* The foot is of moderate width and of the same length as the body. At the front end it is bilabiate, and posteriorly it passes back to a blunt point.

*Rhinophores.* The rhinophores are retractile within short, stout, cylindrical sheaths. This sheath is provided with a funnel-shaped collar with a wavy edge and a deep cleft on its antero-lateral side. The clavus bears a ring of six simply pinnate plumes, the most anterior is quite small, the most posterior is much larger than the others and is continued upwards as a bluntly rounded projecting cylinder.

*Branchiæ.* The branchiæ are in the form of a series of dendritic tufts along the side of the dorsum. They are paired and decrease in size as they pass backwards; the anterior plumes are attached by a wide long stalk and quite distinct from one another, but at the posterior end the stalks are shorter and closer together, so that they form a more or less continuous group. About ten large distinct plumes are present on each side, and a terminal group composed of from 3-5 smaller branchiæ. They are of the same colour as the body of the animal.

*Radula.* As in all the Duvauceliidæ the pharyngeal complex is very large and the radula very well developed. The total number of rows in the radula is 65-67 and the number of teeth in a row—in the first row 9 (*i. e.*,

3.1.1.1.3); in the tenth row 81 (*i. e.*, 39.1.1.1.39), and in the sixteenth row about 273 (*i. e.*, circa 135.1.1.1.135). When removed and flattened on the slide the radula measured 11 mm. along the middle line by 12 mm. at its widest point. The basal plate of the rachidial tooth is approximately rectangular, and the blade consists of three large spines, of which the median is the largest, the most pointed, and it projects well in front of the anterior margin of the basal plate. The lateral spines are blunt and much shorter. The first pleural tooth has a roughly rectangular base, but it is very irregular and it bears a single blunt and irregular spine. The remaining pleural teeth are all of a simple hamate form: they increase in size as they pass outwards, reaching their maximum between the 90th–120th, and then they decrease rapidly to the margin.

*Jaw.* The jaw, as is usual in the family, is very large and strong. Its most prominent feature is the series of serrations that mark its cutting-edge. They are quite small at the upper anterior end near the *erista connectiva*, where they first appear as the continuation of a wavy raised ridge, but they increase noticeably in size as they pass backwards. On the *processus masticatorius* they are quite large, nearly 1 mm. high and easily discernible with the naked eye. The denticles are deep brown in colour, and appear to be inserted into a lighter-coloured ridge. The well-developed jaws measure 18 mm. long by 4.5 mm. at their widest point, and are of a deep horn-brown passing off almost to black near the cutting-edge. They are somewhat narrower than in other species of the genus, and perhaps more widely divergent at their posterior ends.

The genital aperture is situated about halfway up on the right side near the level of the second branchial plume. The penis is short, conical, and unarmed.

The anal papilla lies just behind the third branchial plume, high up on the right side of the body.

*Notes.* There are five specimens of this species in the collection: three with brown mottlings and two quite grey—none with closer locality given than Abrolhos.

However, it is almost certainly the animal referred to by Professor Dakin in his report (32, p. 170) as coming from Wooded Island\*, since his remarks can apply to no other form in the collection, and the long branchiæ do give it a spurious resemblance to *Dendronotus*. He says, "Another animal which was extraordinarily abundant on this little stretch of Lagoon flat (only on the margin) was a large and beautiful nudibranch, almost certainly new and allied probably to *Dendronotus*. The singularity of its occurrence is accentuated by the fact that, notwithstanding its abundance here, not a specimen was captured anywhere else at the Abrolhos, and on our second visit in 1915 it was just as common at this place as two years before."

\* [This observation is quite correct.—W. J. D.]



It does not appear to agree with any previously recorded species, and so is described here as new with the name *Spherostoma dakeni*, after my friend Professor W. J. Dakin, who collected it.

Family HEXABRANCHIDÆ.

This family contains only one genus, and its characters are those of the genus.

Genus HEXABRANCHUS Ehrenberg, Symb. Phys. (1828).

Type by monotypy: *H. prætextus* Ehrenb., pl. 1. figs. A-C.

N.B.—The plates in this work were published in 1828 and the text in 1831. This form appears on the plates.

The body is large and of an elongate-oval shape; the back is smooth and broad. It passes out laterally to a folded margin, which is continued out as the enormous sheet-like much folded mantle, which may be wider than the body. The branchial plumes, generally 6-8, are dendritic and distinct, and arranged in a circle around the anus. They are not retractile, but contractile, and their bases are surrounded by a shallow wide-open depression. The rhinophores have a cylindrical stalk and a perfoliate clavus set at an angle to it. The oral tentacles are large and auriculate with a folded margin. The foot is relatively well developed. The labial armature is well developed and composed of tiny hooked spines. The radula is well developed, with no rachidial tooth, and the pleural teeth are numerous, hamate, and have no lateral denticles. The penis is long and unarmed. Only the posterior blood-gland is present. Bergh classes these as a sub-family of the Dorididæ Cryptobranchiatæ. This name cannot stand, and the forms are not even Cryptobranchiate. They are here raised to a separate family.

Species HEXABRANCHUS IMPERIALIS Kent, Nat. in Austr. 1897, p. 150.  
(Pl. 28. fig. 11; Pl. 29. figs. 41-44.)

*Body.* The body is moderately stout, of an elongated oval shape, and the skin is smooth. The most striking feature, however, is the mantle, which is extraordinarily well developed and takes the form of a thin wide flange, wider than the body, passing all round save at the anterior end, where it is only narrow. The rhinophores with their sheaths stand up prominently at the anterior end, and the circle of gills is conspicuous at the hinder end.

*Colour.* The colour of the preserved specimens is a dull greenish grey without any indications of markings. Professor Dakin says it is identical with Saville Kent's drawing, and that at a distance it looked not unlike a great piece of fresh lung torn from a vertebrate. Kent figures it as of a flaring red colour all over with no markings.

*Dimensions.* The body of the largest specimen measured 125 mm. long by 50 mm. wide and 44 mm. high. Beyond this the mantle extended 80 mm. along each side, 45 mm. across the posterior end, and 6 mm. across the anterior end as a sort of oral veil.

*Head.* The head is fairly large and sub-globose; the mouth is large and conspicuous, having the form of a longitudinal slit. On each side of it is an oral tentacle in the form of a large somewhat ear-shaped flap with a wavy margin. This measured 27 by 24 mm.

*Foot.* The foot is well developed, strong, and muscular. Its front end is abruptly rounded and bilabiate, and the hinder end passes back to a blunt point. The sides of the foot are thrown out into a wide, folded, undulating flange which, in the large preserved specimen, projected 16-17 mm.

*Rhinophores.* The rhinophores are well developed, and the sub-conical perfoliate clavus with 55-60 leaves is set at an angle of about 45° to the cylindrical stalk. The stalk is surrounded by a tubular sheath with a smooth margin, and in some specimens the clavus is retractile within this.

*Branchia.* The six branchial plumes are dendritic, very conspicuous, and arranged in a wide circle. Each of the anterior two pairs gives off a small branch from the base, but the posterior pair each arise by two equally developed main stems coming from the same point.

*Radula.* The radula is well developed and strong, and when removed and flattened measured 10.5 mm. along the middle line and 10 mm. at its widest point. The total number of rows in the radula is 47-49, and the number of teeth is in the first row 40 (*i. e.*, 20.0.20), in the tenth row 130 (*i. e.*, 65.0.65), and in the forty-fifth row 152 (*i. e.*, 76.0.76). There is no rachidial tooth. The inner pleurals consist of a roughly rhomboidal basal plate with a small curved spine at the antero-median corner. As they pass outwards they increase in size, the base gets longer, and the spine increases very markedly. They reach their maximum just beyond the middle of the row, and then decrease in size mainly in the basal plate. Thus it comes that, while the inner pleurals are mostly basal plate with a small spine, the outermost teeth are mainly spine with a small basal plate.

*Labial Armature.* The lips are guarded by a thin tough membrane which is beset with a large number of tiny hooked spines.

The anus is not conspicuous and lies within the circle of gills towards the hinder end.

The genital aperture is well marked, and situated up on the right side of the body behind the level of the front end of the foot. The penis is long and unarmed.

*Notes.* Five specimens were in the collection:—

A large one and a moderately large one with no locality-label.

Two smaller ones from Pelsart Island.

One of fair size from Wallaby Island.

These specimens were obtained from the same place as Kent obtained his *H. imperialis* and are thus topotypic with it. While he gave a coloured drawing of the living form, with which the present specimen agrees closely,

he gave no anatomical details, so that the above is the first description of the radula etc. of the species.

Family ARCHIDORIDIDÆ.

The body is not hard and slightly depressed; the notæum is tuberculate or granulate, the pallial margin is fairly broad; the tentacles are small; the branchial plumes are nearly always tri- or quadripinnate; the foot is fairly broad. There is no labial armature. The radula has no rachidial tooth; the pleurals are numerous and hamate. The penis is generally unarmed.

Genus ALLOIODORIS Bergh, 1904.

Type by monotypy: *A. marmorata* Bergh, Malak. Unters. vi., Semp. Reis. 1904, p. 42.

The body is depressed, the notæum minutely granulose and fairly broad. The branchiæ are not numerous and generally tri- or quadripinnate. Labial armature is feeble or absent. The foot is strong and as wide as the body. The mantle is fleshy and well developed. There is no rachidial tooth. The lateral teeth are numerous and hamate. The last part of the vas deferens in the penis bears a series of hooks. The hermaphrodite gland forms a discrete mass quite distinct from the liver.

This genus was founded by Bergh on some specimens from Tasmania, and is remarkable in that the hermaphrodite gland forms a discrete mass and is not spread out as a layer over the liver. This is a condition encountered also in *Bathydoris* and *Trevelyana*, forms that for other characters are quite widely removed from the present genus. Eliot suggests (38, p. 333) that this perhaps represents an older condition than that in which the gland is spread over the liver, "and it would seem that very different families of the Dorididae sporadically preserve or revert to the older arrangement."

Up to the present only two species have been referred to the genus, viz., *A. marmorata* Bergh and *A. lanuginata* Abr.

Species ALLOIODORIS HEDLEYI, sp. nov. (Pl. 27. figs. 6 & 7; Pl. 30. figs. 45-47.)

Synonymy: *A. marmorata* Basedow & Hedley, Trans. Roy. Soc. South Austr. 1905, p. 152, non Bergh.

*Body.* The general shape of the body is elliptical, slightly broader at the posterior end, and only moderately convex. The entire dorsal surface is covered with minute spiculate papillæ, making it somewhat rough to the touch. The mantle is very well developed, being much wider than the foot, and its fairly thin edge is wavy and undulating.

*Colour.* The colour of the preserved specimen is a dark muddy-fawn with a tinge of green. Irregularly scattered over it are a series of dark brown, almost black, roughly circular, ring-shaped marks from 2-3 mm. wide,

A similar series of markings is present on the under surface of the mantle. The foot is slightly lighter in colour and speckled with dark brownish-black spots.

*Dimensions.* The largest specimen measured 52 mm. long by 34 mm. wide and 23·5 mm. high. The foot measured 42 mm. long by 16·5 mm. wide. Thus it is larger than Bergh's specimen of *A. marmorata* (45 by 25 by 13 mm.), and considerably larger than the measurements given by Basedow and Hedley (22·5 by 10 mm.).

*Head.* The inconspicuous head is very small and tucked in between the front margin of the foot and the large overhanging mantle. The mouth appears as a tiny longitudinal slit, and the oral tentacles are sub-cylindrical and when contracted measure 1·75 mm.

*Foot.* The foot is elongated and narrow; the front end deeply bilabiate and rounded; the hinder end bluntly pointed and in the specimen not quite reaching to the edge of the mantle.

*Rhinophores.* The rhinophores are club-shaped, and the perfoliate clavus occupies almost three-quarters of their length. They are completely retractile within cavities with a circular, slightly raised aperture.

*Branchiæ.* The branchiæ were six in number. Basedow and Hedley (8) state that they were seven or eight, but show only six in their figure. They are retractile within a cavity which opens by a raised, transversely oval aperture with a wavy margin.

The anal papilla lies within the circle of gills; it is low and bears the renal aperture on its right anterior base.

*Radula.* The radula is well developed, and when removed and flattened measured 6 mm. along the middle line and 5·5 mm. at its widest point. The total number of rows in the radula was 33-35 and the rows contained:—the first row 6. 0. 6 (*i. e.*, 12) teeth; the tenth row 55. 0. 55 (*i. e.*, 110) teeth; and the thirtieth row 57. 0. 57 (*i. e.*, 114) teeth. The innermost pleural teeth are small, and consist of a curved spine on an elongated basal plate. They increase very markedly in size to beyond the middle of the row, where they are falciform, and then they decrease again towards the outside. No sign of denticles was found on the lateral teeth.

*Labial Armature.* None was noticed.

The glans penis is armed with a series of rows of hooks.

The hermaphrodite gland is discrete and does not form a layer over the liver.

*Notes.* The collection included three specimens. One small one from Pelsart Island and the other two larger ones with no definite locality-label.

The specimens described by Basedow and Hedley (8, pp. 139 and 152) are from St. Vincent's Gulf and Port River, South Australia, and from Edithburgh, York Peninsula. It has been noted that the specimens here measured are considerably larger than those measured by Basedow and Hedley.

Mr. E. Ashby, who is familiar with this form on the coast of South Australia, informs me that they are usually of the smaller size. It has not been recorded previously from West Australia.

Some confusion exists in regard to the nomenclature of the members of this genus, which deserves comment.

The following forms have been recorded :—

*A. (Doris) lanuginata* Abraham, Proc. Zool. Soc. Lond. p. 255, pl. xxix. figs. 15–17 (1877).

*A. marmorata* Bergh, Malak. Unters. vi., Semper's Reisen, 1904, p. 42.

*A. marmorata* Bergh (*sic*), Basedow & Hedley, Trans. Roy. Soc. South Australia, vol. xxix. p. 152 (1905).

*A. lanuginata* Abr., Eliot, Proc. Malac. Soc. Lond. p. 333 (1907).

*A. hedleyi* mihi, described above.

The original specimen described by Abraham is in the British Museum ; it is not well enough preserved for detailed examination and the pharyngeal complex is removed. Eliot (98, p. 333) states that, on comparing this specimen with that sent by Suter from New Zealand, he has no doubt that they are identical. He gives the genus as containing two species (*A. lanuginata* Abr. and *A. marmorata* Bergh), but lower down on the same page he gives *A. marmorata* as a synonym of *A. lanuginata*, and on p. 335 he states that Bergh's *A. marmorata* is perhaps a distinct species. Further, he suggests that it is not clear that the animal figured by Basedow and Hedley is either of the two species. On comparing the descriptions we find :—

A. LANUGINATA (Abr.).—Colour preserved “greenish-grey, blackish mottlings” (*Eliot*). In the specimens in the British Museum the mottlings are uniformly dark areas (*O'D.*). Colour in life “dirty red, numerous white pustules” (*Suter*), but the applicability of this to the specimen is doubtful.

A weak labial armature. Tentacles long, flat, furrowed on upper surface, and almost auriculate. Rhinophores much closer together in large specimens of *A. hedleyi* than in the far smaller original specimen of *A. lanuginata*. Size 50 mm. long, 33 mm. broad, 16 mm. high. Radula 26 rows, (40–45) . 0 . (40–45). 1st and 2nd teeth characteristic, unlike *A. marmorata* or *hedleyi*.

A. MARMORATA Bergh.—Colour preserved “von hell gelblichweisser Farbe, die von zahlreichen kleineren und (bis 3 mm. diam.) grosseren hell aschegrau, verschwimmenden, unregmassigen Flecken unterbrocken war” (no mention of spots being ring-shaped, which would have hardly escaped Bergh's acute eye).

Labial armature not mentioned. Tentacles 1.5 mm long, “fingerformig.” Size 45 mm. long, 25 mm. broad, 13 mm. high. Radula 34–35 rows, (40–42) . 0 . (40–42). 1st and 2nd teeth like remainder, outer teeth denticulate and not quite same shape as *A. hedleyi*.



*ALLOIODORIS HEDLEYI* mihi.—Colour preserved; dark muddy-fawn with a tinge of green with irregularly scattered dark brown, almost black, roughly circular, ring-shaped marks (*O'D.*). Colour alive: yellowish white to greyish brown, covered with minute spiculose elevations on the dorsal surface, which impart to it a brownish tint; also less numerous, larger elevations, surrounded by irregular circles of deep brown. The latter occasionally have a centre of opaque white surrounded by a ring of reddish brown.

No labial armature. Tentacles small, sub-cylindrical, 1.25 mm. long. Size 52 mm. long, 34 mm. wide, 23.5 mm. high. Radula 33–35 rows (55–57). 0. (55–57). Innermost pleurals small, but much like the remainder, not like those of *A. lanuginata*; outer teeth not denticulate.

I think it will be seen from the above that three distinct forms appear to be represented, of which *A. marmorata* Bergh and *A. hedleyi* mihi, while resembling one another more closely than either of them does *A. lanuginata*, are, nevertheless, distinct species. The form described by Basedow and Hedley is not the same as that recorded by Bergh, and hence it is in need of a new name. I propose to call it *A. hedleyi* after Dr. Charles Hedley, who has added so much to our knowledge of the marine fauna of Australia.

#### Family PLATYDORIDIDÆ.

The body is somewhat flattened, of leathery consistency, sometimes tough and sometimes brittle; it has an oval or sometimes almost circular outline; the notæum is fairly smooth or minutely granulate, the dorsum often marked by tubercles or ridges; the pallial margin is ample; the branchial aperture is generally stellate; the tentacles are digitate; the anterior margin of the foot is bilabiate, and the upper lip indented or split in the middle line.

There is no labial armature; the radula lacks rachidial teeth; the pleural teeth are numerous and hamate.

The prostate gland is large.

#### Genus *ASTERONOTUS* Ehrenberg, 1831.

Type by monotypy: *A. hemprichii* Ehrenb. Symb. Phys. (1831).

The body-form is oval and somewhat flattened; the animal is of a peculiar leathery or india-rubber-like consistency, not hard or brittle. The skin is smooth to the touch, but covered with raised protuberances in the form of ridges, of which one well-marked one runs in the mid-dorsal line from between the rhinophores back to the branchial aperture. The margin of this aperture is produced into lobes (usually six). The foot is narrow, bilabiate anteriorly, and the upper lip indented.

There is no labial armature; the radula has no median tooth and the pleural teeth are simply hamate.

The penis is unarmed, the prostate large, and, according to Bergh, a glandula and hasta amatoria are present.

Species *ASTERONOTUS FUSCUS*, sp. nov. (Pl. 28. figs. 12, 13; Pl. 30. figs. 48-50.)

*Body.* The body is shaped like a typical Dorid—oval and with a moderately arched dorsum. The mantle is well developed, and projects considerably beyond the foot all round. The whole animal is like a piece of india-rubber to feel. The dorsum bears a series of raised elongated tubercles, the largest of which forms an irregular ridge stretching from between the rhinophores back to the branchial aperture. From this median projection a number of unequal and irregular short side-ridges are given off, getting lower as they pass from the middle line, and all around the margin is a number of small oval or roundish tubercles.

*Colour.* The colour of the preserved specimen is a muddy-brown, and a note included with it states that it was "dirty brown, rough surface." Professor Dakin informs me that it was of a dirty brown with some lighter brown spots, but no conspicuous colour-pattern.

*Dimensions.* The specimen measured 27.5 mm. long by 15 mm. wide and 9 mm. high, and the foot 24 mm. by 6.5 mm.

*Head.* The head is quite small with a small mouth in the form of a short transverse slit, and on each side is a small tentacle.

*Foot.* The foot is only moderately broad, with an undulating margin. The anterior end is bluntly rounded, strongly bilabiate, the upper lip is indented in the middle line, and the posterior end is pointed.

*Rhinophores.* The rhinophore has a bluntly conical, perfoliate clavus with a fair number of thin leaves and a short cylindrical stalk. They are completely retractile within cavities, whose margins are slightly raised, so that they look somewhat like a tubercle. In the preserved specimen they are of a yellow colour.

*Branchiæ.* The branchiæ are five in number, each consisting of a large, branched, plume-like gill, arranged in a circle. They are completely retractile within a cavity with a raised margin, so that it stands up like one of the larger tubercles. The edge of this is furnished with six small lobes, which, when the aperture is tightly closed, are tucked inside.

*Radula.* The pale yellow radula when flattened on a slide measured 3 by 2.75 mm. and contained 38-40 rows of teeth. A median tooth is absent, and the number of pleurals in each row was:—in the first 6.0.6 (*i. e.*, 12) and in other rows from the third on 65.0.65 (*i. e.*, 130). The teeth themselves are simply hamate and increase in size as they pass outward to beyond the middle of the line. They decrease in size rapidly at the outer margin, and the last one or two are reduced.

The anus lies on a well-marked papilla in the middle of the branchiæ, and it bears at its base the small oval excretory pore.

The genital aperture, as usual, lies on the right side of the body near the anterior end.

*Labial Armature.* No labial armature was found.

*Notes.* One specimen only is in the collection, and this was accompanied by the locality-label "Shore of Wooded Isle."

Eliot (36, pp. 305-356) calls attention to the difficulties encountered when trying to determine the position of a Cryptobranchiate Dorid, and in dealing with the present form they have come before me frequently. Bergh's family Dorididæ Cryptobranchiatæ is divided into five sub-families and about 30 genera, practically all of which were created by Bergh himself, and certain of them contain only a single species. The differences between some of the genera are so slight that, unless Bergh's own species are dealt with, it is difficult to determine where to place a new form. There seems no doubt that the whole family stands in need of considerable revision before it can be regarded as satisfactory. The present specimen agrees closely with the genus *Asteronotus*, and in general form, and perhaps even colour, somewhat resembles the *A. hemprichi* Ehr. as figured by Eliot (36, pl. xxxiv.), but it differs in certain points. The radula formula is different, the individual teeth are not quite same, the branchiæ number five, etc. For these reasons I have described it as a new species under the name of *Asteronotus fuscus*.

#### Family GLOSSODORIDIDÆ (CHROMODORIDINÆ Bergh).

It has been pointed out above that Bergh's binomial family-name **Dorididæ Cryptobranchiatæ** cannot possibly be allowed to stand. It is proposed, therefore, to split this group into several families, of which one is the same as the old Chromodoridinæ of Bergh. But, as the name *Chromodoris* has to be set aside for the older name *Glossodoris*, the family-name must be changed as above.

The body is elongated, compressed, and soft; the colour is striking, often magnificent, and generally with lines or spots; the notæum is nearly always smooth, the pallial margin is fairly broad at the anterior and more particularly at the posterior end, but usually quite narrow in between; the tentacles are small, conical, and generally partly eversible; the branchial plumes are usually simply pinnate.

The labial armature is strong and composed of minute rods. The rachis of the radula is very narrow and often furnished with minute compressed pseudo-teeth; there are numerous pleural teeth of hamate form and generally with a denticulate margin, the first teeth are usually denticulate on both sides.

There is no proper ventricle.

The penis is unarmed.

Genus *GLOSSODORIS* Ehrenberg, 1831, Symb. Phys. [unpaged, but on p. 92].

Type by subsequent designation: *G. xantholeuca* Ehrenb. Red Sea. Gray, Proc. Zool. Soc. Lond. 1847, p. 164.

But *G. xantholeuca* Ehrenb. = *Doris pallida* Rüpp. et Leuck., 1828.

The type is therefore here designated *G. pallida* (Rüpp. et Leuck.), 1828.

Synonymy: *ACTINODORIS* Ehrenberg, 1831.

Type by monotypy: *A. sponsa*, Ehrenb. Symb. Phys. [p. 93]; *vide* also Gray, Proc. Zool. Soc. Lond. 1847, p. 164.

*PTERODORIS* Ehrenberg, 1831.

Type by subsequent designation: *P. picta* Ehrenb., Gray, Proc. Zool. Soc. Lond. 1847, p. 164.

*CHROMODORIS* Alder & Hancock, 1855.

Type by original designation and monotypy: *D. magnifica* Quoy et Gaim., Alder & Hancock, Mon. Brit. Nud. Moll. pt. vii. 1855, p. xvii.

*GONIOBRANCHUS* Pease, 1866.

Type by designation: *G. vibrata* Pease, Pease, Amer. Jour. Conch. ii. 1866, p. 204.

*Chromodoris*, the generally accepted name for this genus, was introduced by Alder and Hancock (*vide supra*). These authors in a subsequent paper (6, p. 115) say:—"The *Goniodoris* of Forbes has hitherto been considered a northern form—the southern species which some authors have referred to it belonging almost without exception to the allied genus *Chromodoris*, which, on the other hand, has not been found further north than the Mediterranean." The name thus introduced was used by Bergh (11, p. 72), who gives as synonyms *Doriprismatica* d'Orbigny and *Goniobranchus* Pease, and again in 18 (p. 1), but this time with the synonyms *Glossodoris*, *Actinodoris*, and *Pterodoris*, all of Ehrenberg, 1831, twenty-four years earlier than Alder and Hancock's name. Bergh points out there and again in 1884 (23, p. 65) the identity of Ehrenberg's genera with that of Alder and Hancock, and in this he is right.

Thus, in spite of the common usage of the generic designation *Chromodoris*, there is no doubt that Ehrenberg's names have considerable priority. The question as to which name should be employed is easily settled, for, while they were all published at the same time, *Glossodoris* comes first in order, and the first species is given as *G. xantholeuca*, which Gray (44, p. 164) designated as the type-species. Bergh, in a paper where he re-examines Ehrenberg's types, states, in our opinion rightly, that *G. xantholeuca* is the *D. pallida* (Rüpp. et Leuck.), and that all species of *Glossodoris* are congeneric. The genus then stands as *Glossodoris* with the type-species *G. pallida* (Rüpp. et Leuck.).

In various places Bergh includes *Doriprismatica* d'Orbigny, 1837 (11), as a synonym; but, while part of d'Orbigny's genus belongs to the present group, the type, *D. atromarginata* Cuv., 1804, is in reality a member of a

genus of its own, often but incorrectly termed *Cassella* H. & A. Adams, 1858 (3).

The *Goniodoris* of Forbes, 1840 (42), still remains as a valid genus, and so does not enter the synonymy, although certain forms originally included in it really belong to *Glossodoris*.

The body is elongated and rectangular or almost square in transverse section. The smooth dorsum is an elongated oval, rounded in front and behind, and with its long sides approximately parallel. The mantle projects slightly all round and usually forms a frontal and caudal veil. The foot is large and continued backwards as a fairly long pointed tail. The sides of the body are vertical. The oral tentacles are small and conical; the retractile rhinophores have a perfoliated clavus. The retractile branchiæ are composed of simply pinnate leaves. The armature of the labial disc is strong and composed of a number of densely-set small hooks bifid at the tip. The radula contains no rachidial teeth, but there are frequently thickenings which take their place. The lateral teeth are numerous and hook-shaped; the first lateral tooth is denticulate on both sides, the rest denticulate only upon the external margin; the outward teeth are smaller, and denticulate at the extremity. The penis is unarmed.

*Glossodoris* resembles fairly closely in general appearance and shape *Goniodoris*, but the latter is phanerobranchiate. It is also much like *Aphelodoris*, but differs in the presence of labial armature, of denticulate teeth, and simply pinnate branchiæ.

Species GLOSSODORIS WESTRALIENSIS, sp. nov. (Pl. 27. figs. 8, 9; Pl. 30. figs. 51-53.)

*Body.* A coloured sketch by Professor Dakin from the living animal shows that its general shape was that of a typical *Glossodorid*, but the preserved specimens have shrunk considerably, more particularly in the tail-region. The notæum is a fairly narrow, flat oval, equally rounded at each end and the sides almost parallel. In the preserved specimens it contracts considerably, becoming less rectangular and more arched. The sides of the body pass inwards to a moderately narrow foot and the mantle only projects a very short distance.

*Colour.* From Professor Dakin's sketch the general body-colour appears to be a bright blue. The notæum is bordered by a narrow band, yellow on the inside and orange-red right at the margin. The rhinophores are orange-red and the branchiæ red. On the notæum inside the marginal line is a narrow band of blue and then a slightly wider band of deep purple, almost black. This deep band passes round in front and lateral to the rhinophores, and may or may not enlarge slightly to include the margin of their sheaths. At the posterior end it passes round more or less parallel with the margin and behind the branchiæ. In the middle of the notæum the dark band enlarges,



so that on the outside it obliterates the blue band and on the inside it passes across to the other side as a broad band, thus isolating, as it were, two islands of the light blue ground-colour on the notæum. Two similar bands of dark colour pass back on the dorsal surface of the tail.

In the preserved specimens all trace of the orange, red, and bright blue colours has disappeared and the whole ground-colour is of a dirty brownish fawn; the dark lines, on the other hand, are quite clearly visible. In addition to those already noted on the drawing, a narrow dark band passes around the sides of the body at the line of junction of the mantle-fold, and near the anterior end it loops downwards and backwards. It then passes back parallel with its former course, but lower down the side of the body, as a fairly broad streak running out on the dorsal surface of the tail as the two lines already noted. Under the posterior end of the mantle all these dark lines may unite and pass back right to the end of the tail as a single broad band. A narrow dark band runs right around the upper margin of the foot and out to the tip of the tail, where it may or may not unite with the lines already described.

The striking and characteristic distribution of these dark lines is fairly constant in all the specimens and shows well after preservation.

*Dimensions.* The specimens were all about the same size, and measured when preserved:—notæum 20 mm. long by 10 mm. wide; foot 22 mm. long; body 17.5 mm. wide.

*Head.* The head is quite small and overhung by the forward extension of the mantle. The mouth is a small longitudinal slit, and on each side there is a small cylindrical tentacle, much contracted in all specimens.

*Foot.* The foot is linear and its sides almost parallel. It is rounded and bilabiate in front and passes off to a pointed tail posteriorly. The sides of the foot are marked off from the body by a marginal flange. Judging from the sketch of the living animal, the tail may project beyond the notæum about half the length of the latter, but in the preserved specimens it is usually curled up and hardly projects at all.

*Rhinophores.* The rhinophores have a short stalk and a cylindrico-conical perfoliate clavus. They are completely retractile within cavities which have a slightly raised margin.

*Branchiæ.* The branchiæ are fairly simple and arranged in an almost complete circle. The anterior ones are simply pinnate thread-like plumes, sometimes tending to be bifid at the distal extremity; these number nine, although there is a tendency to fusion at their bases. At the posterior end on each side is a group of four similar, but smaller, plumes more closely united at the base, and these when extended may appear as four branches from one stalk.

The anus lies in the middle of the branchial circle. All can be completely retracted within a pocket with a circular aperture surrounded by a slightly raised margin.

*Radula.* When removed and flattened the radula measured 5 mm. by 3.25 mm. and was large and well developed for the size of the animal. The total number of rows in the radula was 83-85, and the number of teeth in each row:—in the first row 20.0.20 (*i. e.*, 40); in the tenth row 72.0.72 (*i. e.*, 144); and in the eightieth row 76.0.76 (*i. e.*, 152). There is no rachidial tooth. The innermost teeth are small but stout, and consist of an elongated base with a marked hook, on the side of which are a series of from 4-6 small triangular denticles. The teeth increase in size as they pass outwards and the hook becomes larger, bearing on its inner curved edge a series of 6-8 denticles and terminating in a rounded point. The outermost teeth are slightly smaller than those nearer the middle of the row. They have their bases much smaller, and the denticles are reduced to one or two blunt projections near the end.

The genital aperture is placed high up on the anterior end of the right side of the body.

*Notes.* In all there were six specimens in the collection: three were from the Abrolhos Islands with no further details; two were from the shore of Wooded Isle, one of which had the pharynx exerted; one was from the shore of Long Island, and this was very dark in colour.

It does not appear to correspond with any previously described form.

Genus APHELODORIS Bergh, Malakozool. Blätt. 1879, p. 107.

Type by monotypy: *A. antillensis* Bergh, *ibid.* p. 108.

In outward appearance these forms very closely resemble the Glossodorids, and have a well-developed notæum beyond which the tail projects. The mantle-edge only projects a very short way. The foot is fairly small, rounded in front, and not very sharply marked off from the body. The rhinophores as in *Glossodoris*. The oral tentacles are short and stunted, and have a cleft on their underside. The retractile gills are composed of a few (5) tripinnate plumes. The lips are only covered with a moderately thick cuticula. There is no rachidial tooth, and the pleural teeth are numerous and hamate. Only a posterior blood-gland is present. The prostate is large and the penis unarmed.

Species APHELODORIS AFFINIS Eliot, Proc. Malac. Soc. Lond. 1907, p. 343.  
(Pl. 27. fig. 10; Pl. 30. figs. 54-56.)

*Body.* The shape of the body is typical of the Glossodorids. The notæum is a moderately long oval with its long sides approximately parallel and the ends equally rounded. It is carried over all round into a narrow pallial ridge. The body is fairly stout and its sides almost upright, running down to a moderately wide foot. The lower part of the body extends out beyond the notæum as a tail.

*Colour.* The body-colour in the preserved state is of a pale yellowish grey, in two specimens with a deeper yellowish-brown narrow line around the edge of the notæum and the foot. In places this line bears still darker dots. In a third specimen the anterior end of the sides of the body, the notæum in front of the rhinophores and behind the branchial aperture, and the dorsal region of the tail are of an umber-brown covered with dark spots. The largest specimen has this coloration still more strongly developed, and the whole of the notæum, body, and foot is of the same umber-brown covered with dark irregular spots, and the anterior region of the notæum is of a very dark brown, almost black. Professor Dakin informs me that the living animals were similarly coloured, but the brown somewhat warmer.

*Dimensions* The largest (and darkest) specimen measured 24 mm. long by 13 mm. wide and 12 mm. high, but this is somewhat distorted. Three others were more or less of a size, and measured 20 mm. long by 9.5 mm. wide and 9 mm. high.

*Head.* The head is small and inconspicuous; it bears a short sub-cylindrical tentacle on each side, between which the mouth appears as a small circular aperture. Each tentacle bears a longitudinal groove on its under surface.

*Foot.* The foot is moderately broad and its sides fairly parallel. The front end is abruptly rounded and the hinder end passes off to a point.

*Rhinophores.* The rhinophores have a short cylindrical stalk and sub-conical perfoliate clavus. They are completely retractile within cavities, whose rims are raised into short dark-coloured tubes.

*Branchiæ.* The five small, dark-coloured, tripinnate, branchial plumes are arranged in almost a complete and very narrow circle. They are retractile within a cavity with a circular non-raised aperture.

*Radula.* The radula when removed and flattened measured 3.5 by 2.5 mm. It is well developed and has no rachidial tooth. The number of rows is from 27-28, and the number of teeth in a row is:—in the first row 6.0.6 (*i. e.*, 12); in the tenth row 42.0.42 (*i. e.*, 84); and in the twentieth row 46.0.46 (*i. e.*, 92). The inner teeth are small simple hooks, somewhat angular and without denticles. They increase markedly in size and become simple curved hooks. Towards the outside they decrease noticeably, and they turn into short hooks only slightly curved.

The anus lies within the circle of gills at its hinder side.

The genital aperture lies about halfway up on the side near the anterior end of the body.

*Notes.* This species was represented by four specimens collected on "Wooded Island."

Eliot (38, p. 343) described a form from New Zealand of which he says, "Colour dirty white with irregular mottlings of dark reddish brown. The epidermis peels off very readily, and it is possible that the brown mottlings may have been much more extensive, or even that the dorsal surface may

have been wholly brown." This agrees closely with my own observations, and the peeling of the epidermis is also similar. The radula formula is given as 60.0.60, and the total number of rows 23; this is not quite the same, but the teeth are apparently identical. He says, further, "oral tentacles white; large, flat, and distinctly grooved." This is not at all in agreement with the present specimens, and, indeed, is not found in other members of the genus. Eliot's form from its teeth and other features undoubtedly is referable to this genus, and I am inclined to think that this description of the tentacles is not quite accurate.

In spite of this one serious discrepancy, the present forms agree so closely with the description of *A. affinis* given by Eliot, that I think it safer to refer them to that species than give them a new specific name.

Genus CERATOSOMA Adams & Reeve, Voyage of 'Samarang,' 1848, p. 67.

Type by monotypy: *C. cornigerum*, Adams & Reeve, *idem*, p. 68.

Species CERATOSOMA BREVICAUDATUM Abraham, Ann. & Mag. Nat. Hist. (4) xviii. p. 142, pl. 8. fig. 6 (1876). (Pl. 28. fig. 14; Pl. 30. figs. 57-59.)

Synonym: *C. oblongum* Abraham, *l. c.* p. 143, pl. 7. figs. 7, 7a, 7b.

Bergh (25) suggests that *C. caledonicum* Fischer, *C. tenue* Abraham, and *C. oblongum* Abraham are all synonyms of *C. brevicaudatum* Abraham. Basedow and Hedley (8, p. 154) call attention to the following:—in the case of *C. caledonicum*, Fischer's description indicates an animal with the lobes of the notæum more developed, and the colour-scheme in the two forms is entirely different. This being so, it seems undesirable to merge the two into one species without further evidence. The same two authors suggest that the differences between *C. brevicaudatum* and *C. oblongum* are due to the amount of contraction undergone upon or before preservation, and state that they have obtained examples of this species exhibiting similar differences from the same dredging. An examination of the external characters of the original specimens described by Abraham, and preserved in the British Museum, leads me to think that they are probably right, and that *C. oblongum* is to be regarded as synonym of *C. brevicaudatum*. I have also examined the original example of *C. tenue* described by Abraham, and, while it is possible that it may also be a synonym, it is somewhat different in appearance, and it is probably better—for the present, at any rate—to keep it separate, as has been done by Basedow and Hedley.

The specimens here described agree closely with the original description given by Abraham and that furnished by Basedow and Hedley, and are undoubtedly referable to *C. brevicaudatum*.

*Body.* The body is large, elongated, slightly wider in the middle than at the two ends, and it increases in height from before backwards to the middle or just beyond. The sides are high, almost vertical, and practically parallel. The back is flattened and continued out into a narrow undulating mantle-

fold, which is rounded at the anterior end, much wider posteriorly, and terminates in a median tongue-shaped projection. The dorsum and sides of the body are quite smooth.

*Colour.* The colour of the preserved specimen is a uniform dull yellowish brown. Basedow and Hedley (8, p. 143) give a full account of its coloration and some excellent figures (8, pl. i.), and Professor Dakin informs me that the present specimens agree with them. The general colour is shaded pinkish buff and pinkish brown; the darker colour is more prevalent towards the margin. Along the margin of the dorsum are a series of light areas, each of which has a violet-purple spot surrounded by a ring of reddish purple. The mid-dorsal region is strewn with scattered circular spots of a light violet-purple colour, in some cases surrounded by a rim of light yellow, and some of these lie in front of the rhinophores. The postero-median projection of the dorsum is covered with a network of brown lines. The sides of the body are similarly coloured to the dorsum, and have a number of small spots approximately arranged in three bands:—the upper and lower are of a rich purple and the median spots of a light violet-purple. The rhinophores and the branchiæ are of a rich reddish-orange colour.

*Dimensions.* The larger specimen, preserved in spirit, measured: 92 mm. along the foot from the tip of the tail to the front end; breadth of the body at the widest part 22 mm.; height of the body 26 mm.; breadth of the dorsum and mantle at the anterior end 22 mm.; at the posterior end 36 mm.; length of tail on dorsal side from the end of dorsum to tip 38 mm. Basedow and Hedley's measurements are "length 111, breadth 25, height 31 mm.," so that, allowing for shrinkage, the present specimen was almost the same size.

*Head.* The head is small and inconspicuous, and is completely overhung by the anterior end of the mantle. The mouth is small and in the form of a longitudinal slit running vertically. On each side of the mouth is a short sub-conical oral tentacle, which can be retracted into a sort of shallow pit.

*Foot.* The foot is linear, rounded at the anterior end, passes off to a blunt point posteriorly, and its margin is wavy.

*Rhinophores.* The club-shaped rhinophores are perfoliate, and the clavus, which is a little more than half the total length, bears a number of closely packed leaves. Each is completely retractile within a cavity, which has the margin of its aperture slightly elevated.

*Branchiæ.* The branchial plumes are twelve in number and incompletely surround the anal cone. The bases of the plumes show a marked tendency to fusion, and the posterior five on each side almost appear to arise from one ridge. Each plume is somewhat dendritic in arrangement.

They are all retractile together with the anus within a cavity that has the margin produced into a short tube.

*Radula.* The radula is strong and when removed and flattened measured 12 mm. by 9.5 mm. The number of rows of teeth is 74–76 and the number



of teeth in a row:—in the first row 25.0.25 (*i. e.*, 50); in the tenth row (117–120).0.(117–120), *i. e.* (284–240); and in the seventeenth row (130–135).0.(130–135), *i. e.* (260–270). There is no rachidial tooth. The inner teeth are in the form of an oblong base bearing a short curved spine. They increase noticeably in size to beyond the middle of the row, where they are hamate with a bluntly pointed corner in the middle of the back. At the outer edge they become somewhat more triangular in side-view, and the last 5–6 have a small rounded denticle near the apex of the spine.

The prominent genital aperture lies on the right side about a quarter of the length of the body from the anterior end and high up beneath the narrow mantle.

*Notes.* This species is represented by two specimens. The larger one taken from near Fremantle and the smaller from the Abrolhos Islands. The latter is interesting, because it bears the parasitic copepods described later.

The type-specimen in the British Museum described by Abraham (1) has for its locality simply Australia, it was recorded by the same author from West Australia as *C. oblongum*. Basedow and Hedley report it from Sydney Harbour, New South Wales; St. Vincent Gulf, South Australia, 20 fms.; Antechamber Bay, Kangaroo Islands, 20 fms. (?); Port Noarlunga, low water, and Salt Creek Bay, Yorke Peninsula\*.

#### Family DENDRODORIDIDÆ (DORIOPSISIDÆ).

The body is nearly always soft and the general shape much as in Archidorididæ. The mouth is in the form of a small pore; the tentacles are small and partly adherent; the rhinophores and branchiæ are very similar to Archidorididæ. The notæum is smooth or tuberculate; the pallial margin is well developed and often with an undulating margin. The foot is broad and much as in Archidorididæ.

The buccal tube is simple and non-glandular. The Bulbus pharyngeus is suctorial, elongated, cylindrical, and destitute of mandibles or radula. The end of the liver is deeply notched.

The penis is armed with a series of hooks.

Genus DENDRODORIS Ehrenberg, Symb. Phys. 1831

[unpaged, but on p. 94].

Type by subsequent designation: *D. lugubris* Ehrenb.; *vide* Gray, Proc. Zool. Soc. Lond. 1847, p. 164.

Synonymy: DORIOPSIS Pease, Proc. Zool. Soc. Lond. 1860, p. 32.

Type by monotypy, *D. granulosa* Pease.

RACHODORIS Mörch, Jour. de Conch. 3rd ser. iii. 1863, p. 34.

Type by original designation, *D. laciniata* "Cuv.," *auct.*

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\* [It was found later by me at Albany, King George Sound, on the South Coast of Western Australia. It has thus a wide southern range with northern extension.—W. J. DAKIN.]

DORIDOPSIS Alder & Hancock, Trans. Zool. Soc. Lond. vol. v. pt. 3, 1864, p. 125.

Type by original designation, *D. gemmacea* Ald. & Hancock.

HAUSTELLODORIS Pease, Amer. Jour. Conch. vol. vi. 1871, p. 299, for the *Doridopsis* of Alder & Hancock.

*Doriopsis*, the generally accepted name for this genus, was introduced by Pease, 1860 (62), who failed to give a satisfactory definition of the genus. Of it Bergh (11, p. 83) says: "Das Geschlecht *Doriopsis* wurde von Pease in der gewöhnlichen Art des Heeres von Art- und Geschlechte-Fabrikanten mit ganz flaschen Charakteren schon in 1860 aufgestellt."

Four years later Alder and Hancock (6) more accurately described the same genus, but gave it the name *Doridopsis*, without, however, referring to Pease's genus or species. Again, the following year Hancock (46) gave a detailed description of the genus, also without reference to the work of Pease. The latter author in 1871 re-affirmed his genus, claimed that the genus of Alder and Hancock was not identical, and suggested for their genus the name *Haustelldoris*. There can be no doubt, however, that all the species of both authors belong to the same genus.

However, Ehrenberg in 1831 had founded the genus *Dendrodoris* for two species, one of which (*D. lugubris*) was subsequently designated the type by Gray (44, p. 164). Bergh (18, p. 21) points out that Ehrenberg's definition of the genus is incomplete and unsatisfactory, although both the species included within it are recognisable and without doubt belong to the genus subsequently termed *Doriopsis*. He further says (*l. c.* p. 22), "Es liegt daher um so mehr wohl kein Grund vor, die Benennung *Dendrodoris* für die durch Hancock und durch mich jetzt so gut bekannten Doriopsen zu restituieren."

This is a strange line of reasoning to follow, for, in the first place, Hancock uses the term *Doridopsis*, not *Doriopsis*, and was not the author of either name. Secondly, while admitting that both Ehrenberg's original species belong to the genus under discussion, Bergh prefers to adopt a much later term, not simply incompletely defined, but actually with "ganz flaschen Charakteren."

There seems little doubt that the genus should stand *Dendrodoris* Ehrenb. with *D. lugubris* Ehrenb. as the type by subsequent designation, and so the name of the family also needs to be altered to Dendrodorididæ.

It is interesting to note that the same species is described under the same name, *Doris lugubris*, by Gravenhorst (43 a) in the same year, 1831. I have been unable to ascertain whether Gravenhorst's or Ehrenberg's name has priority, but, in any case, it does not alter the generic name.

Species DENDRODORIS NIGRA (Stimpson), Proc. Philad. Acad. Nat. Sci. vol. vii. 1855, p. 380.

Synonymy: *Doris nigra* Stimpson, 1855.

*Doridopsis nigra* auct.

*Doridopsis nigra* auct.

*Body.* The body is of moderate size, elliptical, and somewhat depressed. The dorsal surface is finely granulate, while the mantle is more smooth. The

mantle is well developed, fairly thin, and extends beyond the body all round, save that the tip of the tail probably projects slightly during locomotion.

*Colour.* In the preserved specimens the colour is black, shading off to a dark grey near the mantle-margin, but showing no sign of the red margin described by Stimpson in the living animal. It is covered irregularly with tiny white spots, which grow more abundant and larger towards the margin of the mantle. The branchiæ are of the same dark colour as the body. The under surface of the foot is also of a dark grey shade. In life the white spots are more striking and the sole of the foot of lighter grey.

*Dimensions.* The specimens varied in size, and the largest measured 23 mm. long by 15.5 mm. wide and 9.2 mm. high. The smallest was only 12.5 mm. long.

*Head.* The head is very small and inconspicuous, and bears a much reduced tentacle at each side. The mouth is a small circular pore lying between the lips of a deep cleft in the anterior margin of the foot.

*Foot.* The foot is moderately large; its sides are continued out a short distance as shallow flanges and its posterior is bluntly pointed. The front end is deeply cleft, and between its margins, as noted above, the mouth is situated.

*Rhinophores.* The rhinophores are fairly small, completely retractile within sheaths with smooth circular margins, and bear a perfoliate clavus on a short cylindrical stalk.

*Branchiæ.* The tripinnate branchial plumes are eight in number and arranged in the form of a circle, incomplete behind, but the gap is filled in by the low anal papilla. They are of the same general colour as the dorsal surface.

*Radula.* No trace of a radula or pharyngeal complex is present. The œsophagus takes the form of a straight narrow tube.

*Notes.* In all seven specimens were represented in the collection: three large specimens from Sandy Isle; three smaller specimens from Wooded Isle; one deformed and swollen specimen from Pelsart Island.

This species of *Dendrodoris* seems to be widely spread in the Indian and Pacific Oceans, and the type-specimen was described from Loo Choo and Kikaisima.

Species *DENDRODORIS MAMMOSA* (Abraham), Proc. Zool. Soc. 1877, p. 266, pl. lxix. figs. 20-21. (Pl. 28. fig. 15.)

Synonymy: *Doris mammosa* Abraham.

*Doriopsis mammosa* auct.

*Doridopsis mammosa* auct.

*Body.* The body is fairly large and of an elongated oval shape. The mantle is strongly developed, and projects all round as a thin fold about half the width of the body, and has a wavy margin. The very soft dorsum and in part the mantle also are covered with very large irregular warty

protuberances, giving them a very uneven appearance. The large projections also have smaller ones near their bases, and similar small ones are scattered over the general dorsal surface. Three noticeably large projections lie on each side between the rhinophore and the gills, and two more are situated between the rhinophores.

*Colour.* The general body-colour of the preserved specimen is a dirty yellowish grey, becoming darker towards the periphery. Down the middle of the back is a series of three large roughly rhomboidal black marks, which have other very dark, almost black, markings within them. Five or six similar but slightly smaller marked areas lie lateral to the large projections on each side, the first pair of lateral marks being in front of the rhinophores and the last behind the branchiæ. The clavus of the rhinophore is light-coloured and the tips of the branchiæ very dark; Professor Dakin informs me that in life the pattern was similar, but the colours brighter and the contrast more marked.

*Dimensions.* The preserved specimen measured 72 mm. long by 40 mm. wide (mantle extended) by 17 mm. high. The foot measured 65 mm. long by 15 mm. wide, so that the mantle, when extended, projected 12.5 mm. beyond the foot.

*Head.* The head is extremely small and inconspicuous, and the mouth is a tiny aperture lying between the two edges of the front end of the foot. On each side of the head is a tiny flap-like tentacle about 1.5 mm. long, partly retracted within a shallow groove-like cavity.

*Foot.* The foot is well developed, long, fairly narrow, and with an expanded flange-like margin. At the anterior end the foot bears a deep longitudinal cleft, between the edges of which lies the mouth.

*Rhinophores.* The rhinophores are fairly small clavate structures with a perfoliate clavus, and are entirely retractile within cavities provided with an elevated tubular margin. They lie fairly close together near the anterior end.

*Branchiæ.* The five branchial plumes are tripinnate and arranged in a fairly close circle, with a tendency to fusion at their bases. Each is dendri-form. They are retractile within a wide shallow cavity with a slightly raised margin.

*Radula.* No trace of a radula or pharyngeal complex is present, and the first part of the œsophagus is in the form of a straight narrow tube.

The anus lies between the bases of the two hindermost gill-plumes upon a fairly well-developed sub-conical papilla.

The genita aperture is, as usual, high up on the right side of the body about one-quarter of the way from the anterior end.

*Notes.* Only one specimen is represented in the collection with a label "Nudibranch from Fremantle, W.A." It is not therefore an Abrolhos type, so far as we know.

The type-specimen described by Abraham (2) measured 56 mm. long by 44 mm. broad and 16 mm. high, so that it was not so large as the present one. No locality is given, but it is stated to be "obtained during the Antarctic Expedition." It was possibly obtained at some port of call, however, for the Dendrodorids as a genus are characteristic of the warmer seas.

Family EUPHURIDÆ (POLYCERIDÆ, POLYCERADÆ).

The body is more or less elongated and limaciform. The dorsum is not marked off from the sides or separated by a prominent margin. The frontal veil is more or less prominent, simple, or furnished with simple or compound appendages, and the dorsum generally has a solitary dorsal appendage (branchialis) or several dorsal and lateral. The branchiæ are generally paucifoliate, but may be composite; they are not retractile within a cavity. The tentacles are small, lobiform, folded, or auriform. The foot is not broad, and generally rounded anteriorly. The bulbus pharyngeus is simple. The buccal cavity is often armed with laminæ (often composed of minute rods). The radula nearly always has no rachidial teeth; the majority of the pleural teeth are uncinatæ, and the outermost teeth simple, not hamatæ. The glans penis is armed; two spermathecas are present.

In 1798 Cuvier instituted the name *Tritonia* for a genus of Nudibranchs, but while describing the genus he mentioned no particular species, and later, in 1803, he enlarged this description and dealt with a definite and new species, *T. hombergii*. Lamarck in 1801 took Cuvier's name and gave as a species of the genus *T. clavigera*. Rafinesque in 1815 proposed the name *Euphurus* for the *Tritonia* of Lamarck—*i. e.*, with *T. clavigera* as a type. At a later date Johnston (1838) dismissed Lamarck's species as being outside the limits of Cuvier's genus, and proposed for it the name *Triopa clavigera*, under which it has since been dealt with. To turn to other animals than Nudibranchs, however, we find that in 1774 *Tritonium* was employed as a generic name by Müller, and in 1800 Meigen used *Tritonia* as the name of a genus.

Thus it will be seen that the term *Tritonia* as applied to Nudibranchs refers to two entirely different and unrelated forms, and in any case the name is pre-occupied. As noted previously, *Tritonia* Cuvier (*i. e.*, with *T. hombergii* as type) has to be replaced by *Sphærostoma* Macgillivray, and as will be seen above *Tritonia* Lamarck (*i. e.*, with *T. clavigera* as type) becomes *Euphurus* Rafinesque, and this intercepts the later name *Triopa* Johnston. In this way the oldest generic name in the present family becomes *Euphurus*, from which the family-name is derived. This matter is also referred to by Iredale (51) and Iredale and O'Donoghue (51 a).

Genus NOTODORIS Bergh, Journ. Mus. Godeffroy, viii. 1875, p. 64.

Type by monotypy: *N. citrina* Bergh, *l. c.*

The body is limaciform with the sides not marked off from the dorsum; it is hard and rough, often marked with prominent ridges. The frontal veil



is large. The branchiæ and sometimes the rhinophores are protected by valves. The rhinophores are not perfoliate. There is no labial armature of rods or spines, but a chitinous ring may be present. No rachidial tooth is present; the pleurals are similar and hamate with indications of an accessory denticle.

Species *NOTODORIS GARDINERI* Eliot, Fauna & Geog. Maldives and Laccadive, vol. ii. pt. 1, 1903, p. 548. (Pl. 28. figs. 18, 19; Pl. 30. figs. 62-64.)

*Body.* The body is limaciform and covered with small tubercles, which are more numerous and larger at the anterior end. Nearly halfway back the body reaches its highest point, and here arise the branchiæ covered by their three characteristic protecting valves. A row of larger tubercles runs from the sides of the oral veil to the branchial valves. Beyond this the body falls to a lower, narrower, tail-like region. A well-marked valve-like tubercle lies on the outside of each rhinophoral aperture, and between these openings is a group of two or three large tubercles. Lateral to the rhinophores the notæum passes out and forwards as a very well-marked oral veil with a tuberculated margin. The very tough skin contains a number of very hard, semi-transparent spheres, which appear to be composed of a chitinous material. They are irregularly scattered, and may be sparse or so close together that they form hard masses.

*Colour.* According to the coloured sketch made by Professor Dakin, this species is of a deep chrome-yellow all over; the oral veil and branchial valves are of the same colour. There was apparently no trace of the black spots described by Eliot.

*Dimensions.* The specimens were all about the same size and measured when preserved 43 mm. long by 9 mm. wide by 10 mm. high; length of the tail-region 18 mm. Eliot's specimen was 33.5 mm. by 9 mm. by 12 mm.

*Head.* The head is small and in the specimens completely hidden between the front end of the foot and the overhanging oral veil. This veil is very well developed, and in all the specimens is tightly curled down over not only the head but also the anterior end of the foot.

*Foot.* The foot is fairly broad and lanceolate. The front end is rounded and the hinder end passes off to a point.

*Rhinophores.* The rhinophores are completely retractile within deep cavities. The aperture is in the form of an oval slit placed at an angle of about 45° to the main axis of the animal. At the posterior outer corner of the aperture lies a very large tubercle whose flap-like apex overhangs it.

*Branchiæ.* The branchiæ are fairly numerous, very small, and completely hidden by the three large valves. The three valves rise from a transverse ridge stretching across the middle of the back. The middle one passes back and curls downwards until it practically touches the dorsum. The lateral valves pass backwards, down and round partly forwards again, forming the commencement of a spiral. They also practically touch the dorsum. All

the valves, particularly the lateral ones, possess on their margins curious spatulate processes, which were described and figured by Eliot. The valves are very hard and bend over almost to touch the dorsum, so that the tiny gill-plumes, apparently arranged in three groups, cannot be seen without cutting off the valves.

*Labial Armature.* According to Eliot there is no labial armature, but in the specimens here described a circular ring of chitinous cuticle was present. It is not large and quite thin, but, nevertheless, it resisted boiling in potash solution and separated off from the lips as a distinct ring.

*Radula.* The radula contains no rachidial teeth. It is only moderately developed, and contains from 56-58 rows. The first row contained 18.0.18 (*i. e.*, 36 teeth), and the middle rows (34-42).0.(34-42), *i. e.* (68-84). The teeth are erect, moderately long, and slender, and so closely packed at the outside that they are difficult to count accurately. They are a little larger on the outside, but otherwise very similar throughout. Each consists of a more or less rectangular blade-like plate, one corner of which is carried on as a thin, slightly curved rod, bearing at its tip a small rounded secondary denticle. They are similar in general appearance, although differing in detail from those described by Bergh for *N. citrina* (11).

*Notes.* Three specimens were represented in the collection, and bore the label "1st Island. Shore Collecting. Outer side."

Professor Dakin, in his general account of the Abrolhos, says of this species:—"A straggling brilliant lemon-yellow sponge was one very evident specimen. After turning several stones over and noticing what appeared to be pieces of this sponge falling off, it was discovered that the falling pieces were Nudibranchs resembling the sponge both in colour and general appearance. The species belongs to the genus *Notodoris*, this being the first record for the genus on the Australian coast. It was instituted by Bergh for a single specimen of *N. citrina* from Rarotonga. Two other species have been made by Eliot for specimens from Zanzibar and the Maldivé Islands. All three are yellow in colour. It is stated in Eliot's report that nothing is known of the habits of these animals, and further:—"With Mr. Gardiner's specimen is a piece of hard yellow sponge. There is no note, but as the colour and consistency of the sponge closely resemble those of the Nudibranch it is highly probable that the latter frequent it."

"It is interesting to find that this is actually the case and in an entirely different region. Our specimens were always found associated with this sponge. The Nudibranch moves about slowly, so far as could be observed, and apparently lives in the dark under coral blocks."

This association between Nudibranch and sponge is not unknown, as witness the entirely different brilliant red Nudibranch *Rostanga pulchra* living on a similarly coloured sponge on the Pacific coast of North America (*vide* O'Donoghue, 60, p. 152).

As pointed out in the passage quoted above, only three species of this remarkable genus have been recorded: namely, *N. citrina* Bergh from Rarotonga by a single specimen, *N. minor* Eliot from Chuaka on the east coast of Zanzibar by a single specimen, and *N. gardineri* Eliot from the Maldivé Islands also by a single specimen.

In spite of certain minor differences, *i. e.* the presence of black spots, the presence of a Y-shaped arrangement of small tubercles on the dorsum, the absence of labial armature *inter alia* in Eliot's specimen, I have no hesitation in referring the present form to his species, *N. gardineri*. The size is about the same, the teeth similar, the valved rhinophoral aperture similar, and also the branchial valves with their elaborate spatulate processes.

As will be seen the genus is very little known, and it is to be hoped that sufficient material for a detailed investigation of its structure will be forthcoming. It apparently contains three distinct species:—

- N. CITRINA* Bergh.—Pale yellow; somewhat broader; 7 quadripinnate gills; gill-valve with 8 points more than one-third of the way forward; valved rhinophoral aperture; radula 56 rows typically 14.0.4, tooth with indication of third blunt denticle.
- N. GARDINERI* Eliot.—Chrome-yellow with or without black spots, narrower; numerous tiny gill-plumes; gill-valves marked, three in number, furnished with spatulate processes, about halfway back; valved rhinophoral aperture; radula 56–58 rows typically (34–42). 0.(34–42), tooth with only second blunt denticle.
- N. MINOR* Eliot.—Lemon-yellow sharply marked with black lines, narrower; 27 small tufts of gills in three areas; gill-valves three in number, inconspicuous, simple; radula 33 rows typically 25.0.25, tooth not nearly so distinctly denticulate as in foregoing species.

These differences appear to warrant the retention of the three forms as valid species.

Genus *NEMBROTHA* Bergh, Malakol. Unters. Heft xi. p. 450 (1877).

Type here designated, *N. nigerrima* Bergh.

The body is limaciform, nearly smooth; dorsum not differentiated from sides; the rhinophores are retractile with a perfoliate clavus; the branchiæ are paucifoliate and bi- or tri-pinnate; the tentacles are short and lobate; the foot is quite narrow. The labial armature is inconspicuous or absent. The radula fairly narrow. The rachidial tooth is depressed, subquadrate, or an armed curve; the first pleural tooth is large and falciform, and the several external teeth are depressed.

The hermaphrodite gland is connate with the liver; no discrete prostate is present; the glans penis is armed.

There is a possibility that the generic name *Nembrotha* Bergh, 1877, will have to be replaced by *Angasiella* Angas & Cross, 1864: the form described by the latter being very much like those in Bergh's genus—indeed, Bergh himself includes it as a doubtful member of the genus. The matter can hardly be definitely settled unless the collection of further specimens renders it possible to examine it more closely.

Species NEMBROTHA PURPUREOLINEATA, sp. nov. (Pl. 28. figs. 16, 17; Pl. 30. figs. 60, 61.)

*Body.* The body is limaciform, rising from the front end to the middle, where it bears the branchiæ, thence it gets lower again and terminates in a short tail. The smooth dorsum passes over into the side of the body without line of demarcation or pallial edge. The anterior end bears a narrow veil-like expansion.

*Colour.* The general body-colour of the preserved animal is a dirty yellowish grey marked with pale brown lines. A broad dark band commences just behind the rhinophores and passes back in the mid-dorsal line to the branchiæ. A thinner dark line passes round the front, anterior to the rhinophores, and back on each side of the dorsum. Behind the branchiæ these two lines converge and meet, about halfway between the gills and the posterior end, to form one line in the middle which runs back to the end of the tail. Another line starts at the front end about halfway up the body on each side. It runs back roughly parallel with the edge of the foot to join the dorsal line near the tail. Professor Dakin informs me that in life the body-colour of the animal was a translucent slate-grey and the dark bands were purple-brown.

*Dimensions.* The form of the specimen was not well preserved, but it measured 35 mm. long by 10 mm. wide and 11 mm. high.

*Head.* The head is small and not conspicuous. At each side it bears a tiny tentacle, somewhat knob-shaped in the retracted condition, and between them is the circular mouth.

*Foot.* The foot is linear and not strongly developed. The hinder end passes off into the pointed tail, and the anterior end is cleft and has rounded corners.

*Rhinophores.* The rhinophores are small, have a perfoliate clavus, and are completely retractile within cavities with smooth round apertures.

*Branchiæ.* The non-retractile branchiæ consist of five bipinnate plumes, joined at their bases. The anterior one is in the middle line and larger than the others.

*Radula.* The radula is relatively small and when flattened measured 4 mm. by 2 mm. It bears 32 rows of teeth and the number in the oldest row is

7.1.1.1.7 (*i. e.*, 17) and in the newer portions 8.1.1.1.8 (*i. e.*, 19). The rachidial tooth is in the form of a broad irregular octagon with its posterior side uncurved and thicker in its anterior half. Its front edge is straight, but furnished with four curious papilliform denticles directed backwards—one of the inner of these bifid. In the radula of the specimen examined it was always the inner one on the same side. The first lateral has an irregular elongated base lying at an angle of about  $40^\circ$  to the middle line of the radula. It bears two very strong, backwardly directed, conical spines—one at its anterior end and the other about two-thirds of the way back. This is followed by a series of teeth, seven or eight in number. They take the form of approximately square plates in the inner teeth, but become oblong and less strong towards the outside.

*Labial Armature.* The lips are furnished with a lining of thin chitin, which has an oval opening, whose long axis is vertical.

The anus lies on a short rounded papilla in the middle line behind the junction of the bases of the posterior branchial plumes.

The genital aperture lies near the anterior end in the light space between the two lateral dark bands and about halfway between the head and the branchiae.

*Notes.* The species is represented by one specimen, which was taken on the Abrolhos, but with no details of the exact locality.

In spite of the presence of a labial cuticle rather more strongly developed than in other forms, there is no doubt that this belongs to the genus *Nembrotha*. It does not appear to agree with any previously described.

#### A COPEPOD PARASITIC ON *CERATOSOMA BREVICAUDATUM*.

The presence of Copepoda parasitic upon Nudibranchs has been reported by several authorities. The first record is apparently that of Leydig (56), in 1853, who constituted the genus *Doridicola* for Copepods found on Dorids. Similar forms are also reported by Alder and Hancock (5) from *Archidoris tuberculata* and *Antiopa cristata*, and they were referred to the genus *Ergasilus*, although they were probably congeneric, if not even conspecific, with Leydig's forms, as was pointed out later by Hancock and Norman (47). They are not highly modified animals and apparently more in the nature of epizoitic forms, and their parasitism has not been proved.

In addition to these, however, a group of highly specialised forms, undoubtedly parasitic, have also been described. The first, reported by Hancock and Norman (47), are:—*Splanchnotrophus gracilis*, parasitic on *Acanthodoris pilosa* and *Idalia aspersa* from the English coast, and *S. brevipes*, parasitic on *Doto coronata* and *Coryphella rufibranchialis* also from the English coast. The only other authority that has dealt with these parasites is R. Bergh, who has recorded the following:—



Parasite.	Host.	Locality and Reference.
<i>Splanchnotrophus brevipes.</i>	<i>Galvina viridula.</i>	North Sea (21, p. 568).
<i>Splanchnotrophus</i> sp.	<i>Coryphella rufibranchialis.</i>	Norway (21, p. 568).
<i>Ismalia monstrosa.</i>	<i>Phidiana lynceus.</i>	W. Coast, S. America (9).
" "	" <i>inca.</i>	W. Coast, S. America (26).
" "	<i>Archidoris incerta.</i>	W. Coast, S. America (26).
<i>Ismalia</i> sp.	<i>Lomanotus geni.</i>	Mediterranean (21, p. 558)
<i>Briarella microcephala.</i>	<i>Ceratosoma trilobata.</i>	Red Sea (13, p. 409).
<i>Briarella</i> sp. probably.	<i>Glossodoris elisabethina.</i>	Philippines (16, p. 472).
<i>B. microcephala.</i>	<i>Asteronotus bertrana.</i>	Philippines (19, p. 641).

The total number of species is very small, only four named for certain and a possibility of seven at the most, and, from the infrequency with which they have been recorded, it would appear that they are rare. Indeed, in many hundreds of specimens I have handled from British Columbia, I have not yet encountered one. In spite of this, however, it will be seen from the above list that they are widely distributed over the world. The following form is of interest, not only on its own account, as a new species of a rare group, but also because it shows that the group also extends to the Australian seas.

Family CHONDRACANTHIDÆ.

Genus SPLANCHNOTROPHUS Hanc. & Norm. Trans. Linn. Soc. Lond.  
xxiv. 1864, p. 51.

Type here designated: *S. gracilis* Hanc. & Norm. *l. c.* p. 51.  
Coast of England.

*Female.* Head and thorax either blended into a single segment, the thoracic portion of which is furnished on each side with unarticulated arm-like appendages or lobes, or the first part only of the thorax is united with the head and the last part forms a second, but comparatively minute, segment. In this case, however, all the thoracic appendages are attached to the first segment. First antennæ minute and few-jointed; second larger, in the form of prehensile hooks. Labrum large, overhanging the mandibles, which organs, together with the maxillæ and two pairs of foot-jaws, are minute and crowded round the mouth. Thoracic feet two pairs, minute, simple or two-branched, terminating in hooks. Abdomen two-jointed, the last joint ending in two caudal appendages, which are furnished with one or two simple setæ. Ovipigerous sacs elliptical.

*Male* minute. Cephalothorax with lateral appendages and divided into four segments, the first of which bears two pairs of thoracic feet.

Species *SPLANCHNOTROPHUS SACCULATUS*, sp. nov. (Pl. 30. figs. 65, 66.)

*Female.* The body is elongated and roughly cylindrical, but slightly depressed dorso-ventrally, and it is encased in a thin, not very strong, layer of semi-transparent chitin. It is composed of a cephalothorax, of which the anterior portion is the head, but it is not distinctly marked off from the thorax, and a much smaller abdomen. On the dorsal surface of the cephalothorax are three sac-like outbulgings of the body-wall. The first of these is in the form of a transverse collar-like ridge right across the body, and it is somewhat firmer than the other two. The second is much larger, more inflated, and more irregular. The anterior border and the lateral lobes of it are sharply marked off from the body, but in the mid-dorsal region the hinder parts of the two lateral lobes merge with the general surface of the body. The third sac is, if anything, larger than the second, and its lateral lobes show a slight marginal indentation.

The last portion of the thorax is narrower than that in front, but it swells out towards its hinder edge and then rapidly narrows again still further to the point where it joins the abdomen.

From the ventro-lateral aspects of the cephalothorax arise three pairs of long, tapering, cylindrical outgrowths. The first pair arise at a level between the first and second dorsal sacs. The second pair arise at a level between the second and third dorsal sacs, and the third pair touch the second and are level with the third dorsal sac. These lateral outgrowths are not, as might be supposed at first sight, modified appendages, for the rudiments of these lie on the ventral surface, but they are outgrowths of the body-wall. They are very conspicuous, as they almost double the length of the animal itself, and apparently are concerned with the absorption of nutritive material from the host, since they lie in the spaces between the viscera.

Strings of eggs, either in single or double rows, show through the body-wall and form a network of interlacing lines in the various parts of the cephalothorax, the dorsal sacs, and the basal portions of the long outgrowths.

The first antennæ are a pair of minute, stumpy, seemingly uniramous appendages lying under the head a short distance from the anterior end. Each is apparently composed of three joints and bears a number of relatively stout spines; there are three of these on the basal joint, two on the next, and two on the terminal joint. The second antennæ, while still small, are considerably larger than the first, and are plump, fleshy, uniramous appendages also showing indications of three joints. They are relatively shorter than the corresponding members in *S. gracilis*. Stout spines are also present on these: two on the basal joint, one on the next, and two on the terminal joint.

The labrum is large, curved ventrally, and sub-triangular in shape with a rounded apex and a deep curved indentation in the base. The mouth presumably lies under this indentation. The mandibles are small and consist of

a soft triangular base, which bears at its antero-median corner a small stiff blade with three denticles. The maxillæ are very small triangular lobes partly hidden by the mandibles. Each bears a spine-like prolongation at its antero-median corner. The first maxillipedes are somewhat triangular in shape, not unlike the mandibles, save that in place of the blades they bear spine-like processes. The second maxillipedes are long thin structures, expanded dorso-ventrally in their anterior region, and bearing spine-like prolongations at the anterior end. They are approximated in the mid-ventral line over the front part of their length, but diverge posteriorly. Altogether the mouth-parts show a considerable resemblance to those of *S. gracilis*, but their proportions are different, and they appear to be a little more degenerate.

On the ventral side of the cephalothorax there are a pair of rounded papilliform processes opposite the bases of the first lateral appendages, and another and quite similar pair opposite the ends of the last pair of lateral outgrowths. These are in the same relative position as the tiny legs in *S. gracilis*, as shown in the drawing of Hancock and Norman, but, while each bears a small spine, they are not nearly so much like thoracic appendages as those of *S. gracilis*.

If we adopt the interpretation given by Hancock and Norman (47, p. 52), two regions can be distinguished in the abdomen: the first an inverted cone joining on to the posterior end of the cephalothorax and the second another inverted cone with a rounded edge at the base borne on the preceding part. This second cone has a firmer chitinous covering than the cephalothorax and bears four annular grooves; thus it is divided up into five rings, but whether these represent actual abdominal segments or not it is hardly possible to say. Hancock and Norman group the anterior cone-shaped portion together with the basal ring of the second cone as the first complete abdominal segment, although in the present species there is a distinct, annular, articular groove separating them. The basal ring of the second cone-shaped portion has two lateral projections upon which the egg-sacs are borne. On the terminal portion of the abdomen are two small cylindrical projections each terminating in a short spine.

The egg-sacs are elongated, cylindrical, soft-walled sacs with rounded ends. The sacs measured, in one individual, 6.2 mm. long by 1.2 mm. wide. The eggs within them are apparently just crowded together without definite arrangement, as is characteristic of the family Chondracanthidæ, and do not exhibit the linear arrangement that is found in the Caligidæ.

*Notes.* Two specimens of this species were found upon one individual of *C. brevicaudatum*, both female and about the same size. The one of these measured 8.5 mm. long by 4.1 mm. broad; its egg-sacs, as noted above, were 6.2 mm. long by 1.2 mm. wide and the length of the longest lateral process was 14.75 mm. One specimen was partially embedded in an actual hole in the body-wall of the Nudibranch about 5 mm. behind the urinary aperture,

and looked as if it were in the process of boring its way down to get into the body-cavity. This specimen was very noticeable from the outside, and its long lateral appendages and most of the body projected freely from the dorsal surface of its host. In examining this individual it was noticed that two peculiar sac-like structures containing eggs of a deep golden-yellow colour were projecting from the much dilated renal pore. Further examination and dissection revealed the presence of a second and slightly larger example of the parasite completely hidden within the body of the host—the measurements of this specimen are given above. It was lying within the renal duct at its posterior end, but it was so large and its lateral arm-like appendages spread about so much among the viscera that it was not possible to see whether the animal was completely confined within the renal duct, which had become enormously dilated and ramified, or whether it had broken through the wall of this structure.

While the specimen on the outside of the Nudibranch contained eggs within the body, visible through the semitransparent body-wall as a tracery of lines, it showed no sign of egg-sacs. If these had not been torn off, therefore, it would appear as if the production of eggs had not proceeded far in this individual. In the second specimen, on the other hand, egg-sacs were present and of large size. As noted above, they projected through the renal pore, which was much enlarged or perhaps actually broken, and also projected through the partially closed branchial aperture. They were extremely thin-walled and delicate, and in the subsequent process of excavating the ramifications of the parasite from the body of the host they were badly broken up—fortunately not until after they had been measured. When the branchiæ were expanded, the egg-sacs must have lain among the branchial plumes as described in *S. gracilis*. The body of this individual also contained a number of eggs showing through the body-wall, and arranged in a series of inter-lacing lines which passed out into the lateral processes.

No trace of a male individual was found either on or near the females, or upon or in the body of the host. This is rather remarkable in view of the fact that Hancock and Norman state that the males, sometimes to the number of a dozen, are generally to be found associated with the females.

The present species is undoubtedly congeneric with *S. gracilis* Hancock and Norman, and quite similar to it in a number of ways. It differs in a number of points, however: the presence of the dorsal sacs, the segmentation of the abdomen, the more degenerate condition of the thoracic limbs, the greater length of the lateral appendages, and certain differences in the mouth-parts *inter alia*, and so it is here listed as a new species under the name *Splanchnotrophus sacculatus*. It is interesting to find a form from the Antipodes so closely allied to *S. gracilis*, heretofore only recorded from the European seas.

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## EXPLANATION OF THE PLATES.

## PLATE 27.

The photographs on this plate were all taken by Mr. Herring, of the British Museum.

- Fig. 1. *Tethys gigantea* (Sowerby). Dorsal aspect,  $\times$  about 2/3. The large expanded lobes at the anterior end of the foot and the anal funnel are clearly shown.
- Fig. 2. *Tethys ænisoni* (Smith). Dorsal aspect,  $\times$  1. The anal funnel in this specimen is folded in.
- Fig. 3. *Dolabrifera pelsartensis*, sp. nov. Dorsal aspect,  $\times$  1.
- Fig. 4. *Placobranchus expansa*, sp. nov. Dorsal aspect,  $\times$  1. The anterior extension of the mantle lobe in front of the flattened head shows clearly on the right side, but is torn and folded on the left. The anterior end of the head with the tentacles is withdrawn and does not show. The tiny pericardial swelling appears just behind the head. Owing to the shadow produced by lighting, a false impression of a solid body is given. In reality this region is mainly composed of the mantle lobes, and the actual body is not quite as wide as the head; it cannot be distinguished from the lobes.
- Fig. 5. *Sphærostoma dakei*, sp. nov. Ventral aspect,  $\times$  1. The mouth shows as a longitudinal cleft at the anterior end, and part of the oral veil with one projection appears on the left-hand side. The margins of the foot in this specimen are almost approximated. Some of the large branchiæ show clearly on each side.
- Fig. 6. *Alloiodoris hedleyi*, sp. nov. Dorsal aspect,  $\times$  1. The granulate appearance of the back and the nature of the branchial and rhinophoral apertures are clearly visible.
7. — Ventral aspect of the specimen illustrated in fig. 6,  $\times$  1. The tiny head is not visible.
- Fig. 8. *Glossodoris westraliensis*, sp. nov. Dorsal aspect,  $\times$  1. The dark band near the margin of the notæum shows faintly.
9. — Lateral aspect,  $\times$  1. The broad dark band on the side of the body and the narrow one on the upper edge of the flange of the foot are visible. The front end of the foot is clearly bilabiate.
- Fig. 10. *Aphelodoris affinis* Eliot. Dorsal aspect,  $\times$  1. In places the darker line around the notæum is seen, and the dark-coloured branchiæ show in the circular spot towards the posterior end.

## PLATE 28.

The photographs on this plate were all taken by Mr. Herring, of the British Museum.

- Fig. 11. *Hexabranchus imperialis* Kent. Dorsal aspect,  $\times$  2/3. The branchiæ and the clavus of the right rhinophore are clearly visible, and the relatively enormous size of the mantle folds can easily be judged.
- Fig. 12. *Asteronotus fuscus*, sp. nov. Dorsal aspect,  $\times$  1. This shows the ridges in the central region of the dorsum.
13. — Ventral aspect of the specimen illustrated in fig. 12,  $\times$  1. The relative sizes of the foot and mantle show clearly. The indentation at the posterior end is where a portion of the mantle has been broken away.
- Fig. 14. *Ceratosoma brevicaudatum* Abraham. Dorsal aspect,  $\times$  1. The tail is bent to the right, otherwise this gives a good idea of the shape of the animal and also the position of the rhinophoral and branchial apertures and the tongue-like prolongation of the dorsum.

- Fig. 15. *Dendrodoris mammosa* (Abraham). Dorsal aspect,  $\times 1$ . While the general appearance is shown well there is no indication of the colour-markings.
- Fig. 16. *Nembrotha purpureolineata*, sp. nov. Dorsal aspect,  $\times 1$ . This indicates the general form of the animal, save that the tail is turned to the right, and also the position of the branchiæ.
17. — Lateral aspect of the specimen illustrated in fig. 16,  $\times 1$ . This shows the way in which the body increases in height to the level of the gills and then falls away to the tail.
- Fig. 18. *Notodoris gardineri* Eliot. Dorsal aspect,  $\times 1$ . The general form of the body with the tail turned to the right; the rhinophoral apertures and the branchial valves are clearly shown.
19. — Lateral aspect,  $\times 1$ . The tail in this specimen is turned up. It shows clearly the rough nature of the surface, the large size of the branchial valves, and here and there some of the hard spheres.

## PLATE 29.

All the figures on this plate were drawn from preparations from specimens in the collection and at the various magnifications shown by the aid of a camera lucida.

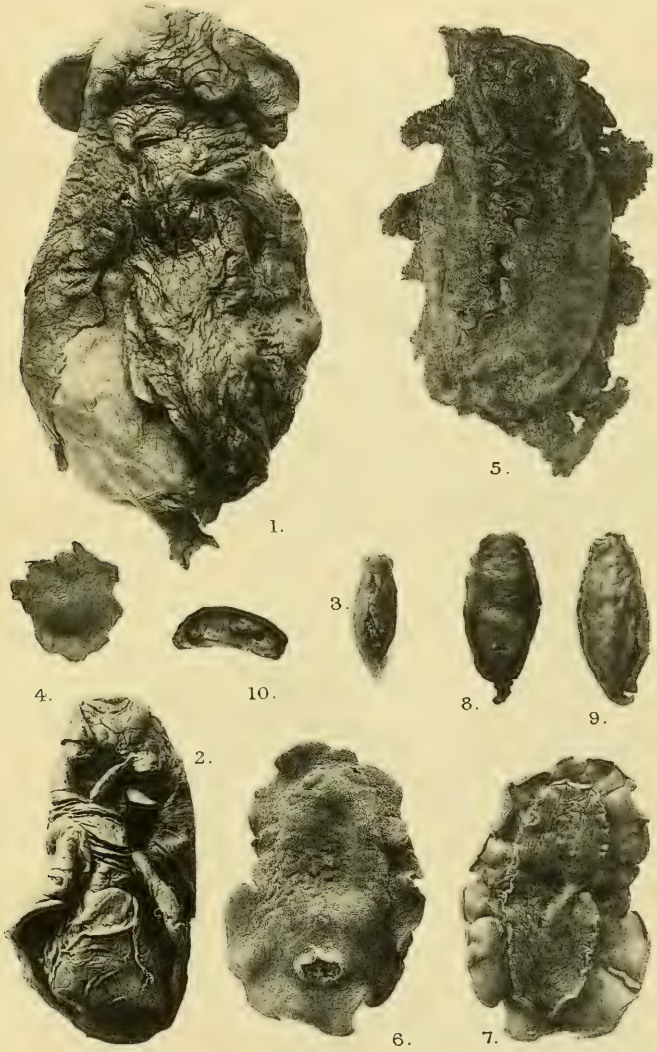
- Fig. 20. *Tethys gigantea* (Sowerby). The median tooth and first two pleural teeth of one side,  $\times 97$ .
21. — Three pleural teeth from near the middle of the row,  $\times 97$ .
22. — The six outermost pleural teeth,  $\times 97$ .
- Fig. 23. *Tethys denisoni* (Smith). The median tooth and first two pleural teeth of one side,  $\times 97$ .
24. — Three pleurals from near the middle of the row,  $\times 97$ .
25. — The seven outermost pleurals,  $\times 97$ .
- Fig. 26. *Dolabrifera pelsartensis*, sp. nov. The median tooth and first two pleural teeth of each side,  $\times 97$ .
27. — Three pleurals from near the middle of the row,  $\times 97$ .
28. — The four outermost pleurals,  $\times 97$ .
- Fig. 29. *Berthella plumula* (Montagu). The two innermost pleurals,  $\times 250$ .
30. — Two pleurals from near the middle of the row,  $\times 250$ .
- Fig. 31. *Placobranchus expansa*, sp. nov. Three teeth near the inner end of the radula, seen from the side,  $\times 190$ .
32. — A single tooth from near the outer end of the radula, seen from the side,  $\times 190$ .
33. — A single tooth from near the outer end of the radula, seen from above,  $\times 190$ .
34. — A single tooth from the sac, seen from the side to show the relatively small size,  $\times 190$ .
- Fig. 35. *Sphærostoma dakeni*, sp. nov. The jaws, antero-ventral view,  $\times 3$ .
36. — The jaw, lateral view,  $\times 3$ .
37. — Two rows of the median tooth and the first pleural tooth on each side,  $\times 97$ .
38. — The four pleurals next to the innermost pleural,  $\times 97$ .
39. — Three pleurals from near the middle of the row,  $\times 97$ .
40. — Three outermost pleurals,  $\times 97$ .
- Fig. 41. *Hexabranchus imperialis* Kent. The four innermost pleurals,  $\times 70$ .
42. — The fourth pleural, side view,  $\times 70$ .
43. — Three pleurals from near the middle of the row,  $\times 70$ .
44. — Four outermost pleurals,  $\times 70$ .

## PLATE 30.

All the figures on this plate were drawn from preparations from specimens in the collection and at the various magnifications shown by the aid of a camera lucida.

- Fig. 45. *Alloiodoris hedleyi*, sp. nov. The four innermost pleurals,  $\times 97$ .  
 46. — Four pleurals from near the middle of the row,  $\times 97$ .  
 47. — The four outermost pleurals,  $\times 97$ .  
 Fig. 48. *Asteronotus fuscus*, sp. nov. The three innermost pleurals,  $\times 150$ .  
 49. — Three pleurals from near the middle of the row,  $\times 150$ .  
 50. — The five outermost pleurals,  $\times 150$ .  
 Fig. 51. *Glossodoris westraliensis*, sp. nov. The four innermost pleurals, lateral aspect,  $\times 162$ .  
 52. — Three pleurals from near the middle of the row, lateral aspect,  $\times 162$ .  
 53. — Three outermost pleurals, lateral aspect,  $\times 162$ .  
 Fig. 54. *Aphelodoris affinis* Eliot. The four innermost pleurals,  $\times 150$ .  
 55. — Two pleurals from near the middle of the row,  $\times 150$ .  
 56. — The five outermost pleurals,  $\times 150$ .  
 Fig. 57. *Ceratosoma brevicaudatum* Abraham. The four innermost pleurals,  $\times 97$ .  
 58. — Four pleurals from near the middle of the row,  $\times 97$ .  
 59. — The five outermost pleurals,  $\times 97$ .  
 Fig. 60. *Nembrotha purpureolineata*, sp. nov. The labial cuticle, lateral aspect,  $\times 10$ .  
 61. — The rachidial tooth and the pleurals of one side,  $\times 97$ .  
 Fig. 62. *Notodoris gardineri* Eliot. Labial cuticle, front view,  $\times 10$ .  
 63. — Four inner pleurals, lateral aspect,  $\times 97$ .  
 64. — The four outermost pleurals, lateral aspect,  $\times 97$ .  
 Fig. 65. *Splanchnotrophus sacculatus*, sp. nov. Dorsal aspect,  $\times 5$ . D.S. Dorsal sac; E.L. Line of eggs; E.S. Egg-sac; L.A. Lateral appendage.  
 66. — Ventral view of the mouth-parts,  $\times 62$ . The parts are somewhat distorted by the pressure of the cover-glass, and the first antenna on the left side of the drawing has been turned forwards. 1 A. First antenna; 2 A. Second antenna; L. Labrum; M. Mandible; 1 Mp. First maxillipede; 2 Mp. Second maxillipede; Mx. First maxilla.





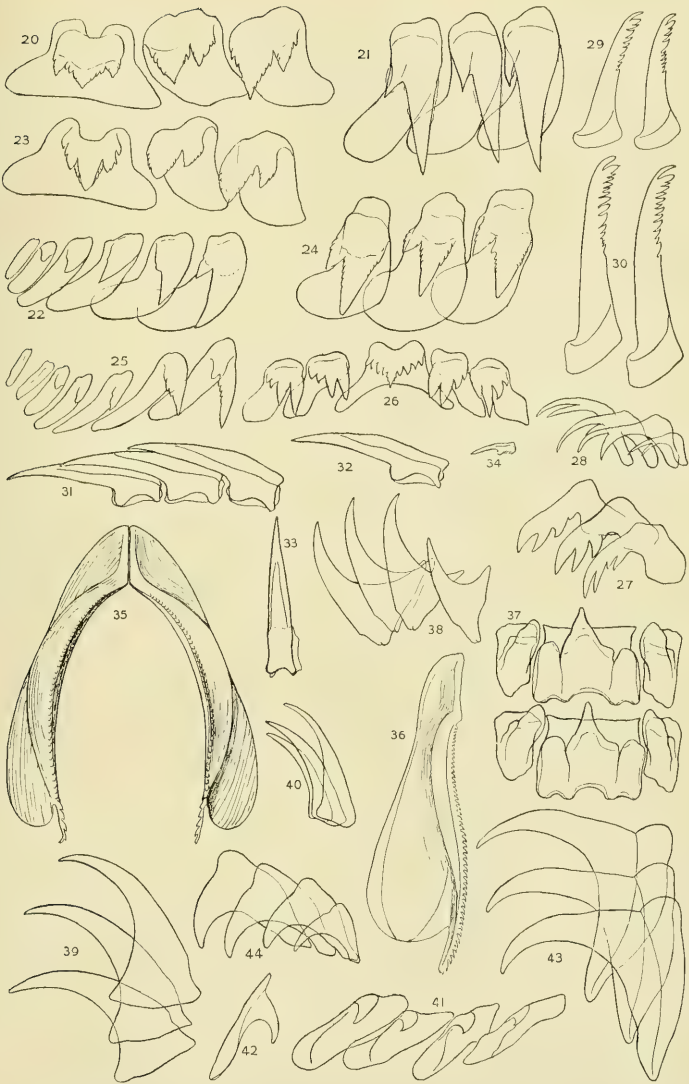
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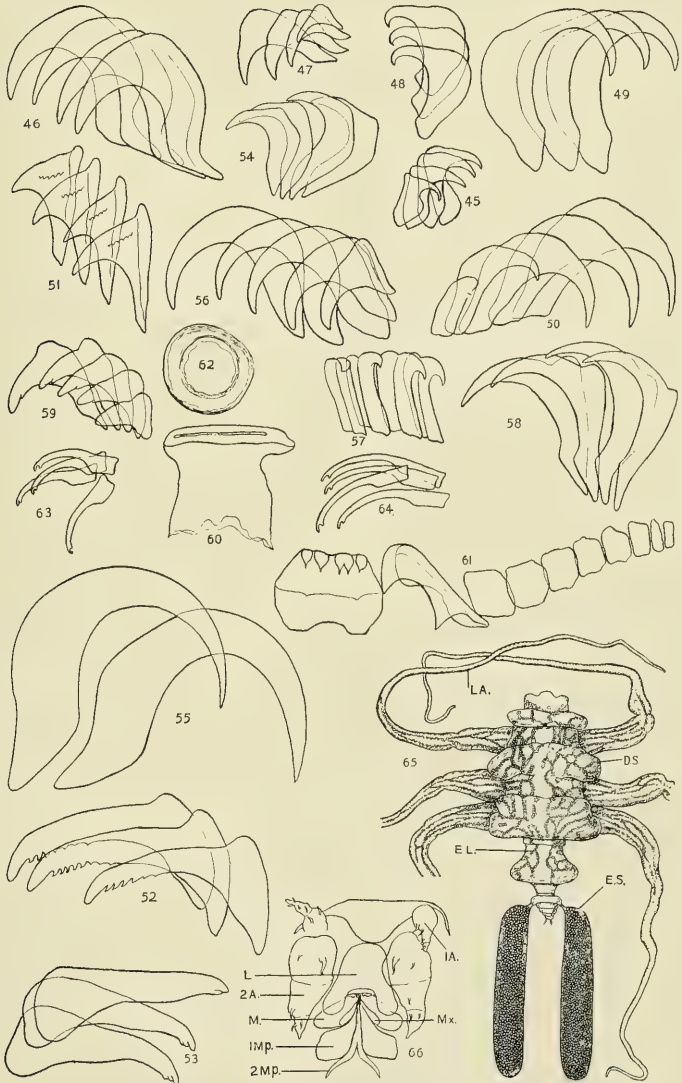


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ABROLHOS OPISTHOBRANCHIA.



OPISTHBRANCHIATA FROM THE ABROLHOS ISLANDS.



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